The Builder.

VOL. XXVIII.—No. 1408.

Grand Cairo.

THERE are two cities which, from their peculiarity of position and the unusual character of their surroundings, strongly impress the mind of the traveller who sees them for the first time; and where the feeling aroused by the sight of them is not merely admiration of their extreme beauty, but the perception of a quality that they possess which is akin to the sublime. One of these is Venice, the sea-born, sea-girt Venus, as an old writer terms her, springing from the ocean bed, surmounted by the conch of St. Mark's, and graced by multitudes of cupolas and towers. The other is the queen city of the desert, Cairo, also rising in grandeur from a long level line, that of the sandy plain, and also crowned with innumerable domes and minarets. Both are surrounded, or nearly so, by a vast and apparently boundless expanse—Venice by that of the waters of the Adriatic, which if pursued to their utmost limits would lead to the shores of Africa and the Pillars of Hercules; Cairo by that of the sandy desert, which if followed out would lead past the kingdom of Theodoros, through the domain of Livingstone, to the territory of the Bosjesmans and Boers. In both cases this expanse is trackless, except where, in the one case the wrecks of vessels, and in the other the white ribs of the foundered ships of the desert, point out the road; in both cases it is silent, for the velvety footfall of the camel makes no more noise than the oar of the gondolier. And both have the claim of age, for both were founded above a thousand years ago. Thus each has these elements of the sublime in its position—vastness, silence, repose, and hoar antiquity. But in this quality of sublimity, and even in that of beauty, the City of the Sea must yield the palm to the City of the Desert, for when looking at her domes athwart the lagoons, one does not see, as at Cairo, the summit of the eternal Pyramids looming in the distance, nor do the cupolas of St. Mark's, and the Salute, and the tower of the Campanile equal in loftiness or in elegance the domes of the Mosque of Sultan Hassan and other tombs of the Kalifs and the two hundred and fifty minarets attached to the other mosques and sepulchres. We defy any traveller, however much he may have seen of Eastern cities, not to be impressed with the aspect of Cairo when he beholds it for the first time, whether he sees it from the railways of Alexandria or Suez, or whether he looks down upon it from the ramparts of the Citadel of Saladin.

It was our good fortune to behold it for the first time from the latter spot, for it was evening when we reached Cairo, and we sought rest and refreshment in a comfortable hotel in the Esbekiah, a large square in the outskirts of the city, planted with trees, and surrounded by the principal hotels and other houses of the Franks. The next morning we drove to the citadel, through the only street practicable for carriages, preceded by a runner, who shouted warnings to the veiled women and turbaned men who thronged the bazaars. How we reached our destination without overturning man, woman, or child, in this crowded street, is to us a wonder to this day. Having ascended to the citadel, which is situated on the spur of a hill, we looked down upon the splendid panorama beneath us. Immediately under the walls was a vast piazza, bounded by low, flat-roofed houses, from amongst which rose at one side of the square a majestic mass of masonry, surmounted by a dome, and relieved by two lofty minarets of unequal height. The whole square was filled with rejoicing Orientals, in their many-coloured garments; every shade of every colour was to be found among them; and as they swayed to and fro, they resembled, more than anything else, a bed of tulips agitated by the breeze. It was the occasion of the fête of Sultan Hassan, and all Cairo was assembled in the vicinity of his mosque,—the fortress-like building that adjoined the square,—which was that of Roumeli. Beyond the piazza was an interminable series of small white squares—the flat roofs of houses—intersected by dark lines of shade, which marked the courses of the tortuous *sooks* or alleys, for few of them deserve the name of streets. Here and there were roofs of a domical form, those of the *hammams*, schools, and other public buildings; and the whole was relieved by the elegant outlines of stilted domes and by the graceful minarets, which caught the sun's rays, and reflected them from every face of their honeycombed corbellings; and from their pierced and traceried balconies beyond this glittering mass, there appeared to be a vast lake,—for it was the period of the inundation,—in the midst of which the course of the Nile could be here and there traced by the palm-trees on its banks; while through the mist, caused by evaporation, were to be seen the dim outlines of the Pyramids. Such a view as this is seldom forgotten. Everything we saw was Oriental in character. At Constantinople, Italian palaces and hybrid Gothic churches break the spell, and recall us to the plots and intrigues of Frankistan; but here the Frank quarter is so distant that we saw no formal rows of modern houses, nor black-coated gentry riding on donkeys, to remind us of the grooves and trammels of European civilisation.

Whilst in the citadel we visited the mosque and tomb of Mehemet Ali. We were, however, disappointed with this specimen of modern Egyptian architecture. The plan is good, being that of a square with a semicircular apse on each side, and the materials of which it was constructed were of the richest, the columns being of marble, and taken from ancient buildings, and the walls, to a certain height, being lined with darkly-veined Oriental alabaster; but the details are rococo, the colouring is tawdry, and the general effect that of coldness and dreariness, which one perceives in the modern mosques of Stamboul. The rich carpets and pendent lamps alone relieved it. Had the founder been content to take for his model one of the numerous mosques that lay in the city under his eye, he would have left behind him a work that would have been the admiration of posterity; but it seems that it is not in England alone that full appreciation of truth and beauty has passed away.

The mosque of Sultan Hassan, to which we, ascending from the citadel, elbowed our way, through a crowd occupied in watching rows of felt-capped dervishes swaying from side to side in measured time; past the stalls of vendors of sweetmeats, and immense swings in which bearded Moslems, who in their amusements are but children, were taking great delight,—offers a fine contrast to that of Mehemet Ali.

We emerged from the crowded place into a narrow street, in which was situated the entrance to the mosque, and here we gazed up at its walls, which are 120 ft. high, built of alternate courses of dark and light coloured stone and marble, and finished by a rich corbelled cornice of great projection. This mode of building in parti-coloured courses, which is common to all the Cairene buildings, and indeed prevails generally throughout the East, gives scale to a building, and at the same time a satisfactory appearance of solidity. The doorway is situated in an arched recess, 100 ft. high, reminding one of the three western arches of Peterborough Cathedral. It is reached by a flight of twenty or thirty steps. On entering, we found ourselves in a small chamber, in which were stationed the guardians of the mosque, who directed us to take off our shoes, and enveloped the shoes of a lady who accompanied us in pocket-handkerchiefs, as she very naturally objected to walk shoeless on the cold marble pavement; we then passed through a low winding passage and entered the body of the mosque, which may be described as a cube of about 115 ft., with the top off; that is to say, it was open to the sky. In each face of the cube was a vast pointed arch, about 60 ft. in span, opening into a square or oblong recess: one of these recesses was larger than the rest, and had two doors in the inner wall, which led to another square hall, the tomb of the Sultan. In the centre of the court was a large domed fountain for ablution.

The effect of the whole was that of simple grandeur, arising from the vast dimensions of the arches. Passing a row of turbanned worshippers who were going through their prostrations, under the guidance of a *Mollah*, with as much regularity as soldiers follow their fugleman, and who did not seem to regard the presence of a female in their holy place as a pollution, we followed our dragoman into the inner hall or tomb. This was a square of about 60 ft., lighted by windows at the sides, and covered by a lofty dome. The painting and gilding were faded, the ornaments crumbling to dust, and the whole had a dilapidated look, though it will be ages before the building itself can become an actual ruin, as the walls are generally 13 ft., and in some places 25 ft., thick. The windows which light the tomb are two-light, with circular apertures above them. They are set in trefoliated recesses. There is resemblance in these and in the windows of most of the mosques of Cairo to Gothic of the Plate Tracery period, which has become so much the fashion in England; and there is indeed much to be learnt from these fine specimens of Saracenic architecture by an architect whose mind has not been narrowed by exclusive study of one particular school. This mosque was built in the fourteenth century, and is of the later style, resembling the Byzantine. It was probably built by Sultan Hassan, during his lifetime, and was destined, like that of Mehemet Ali, for his tomb. In most cases the tomb of the founder adjoins the mosque, and has a dome. The mosque proper in Cairo has no dome, but a flat roof. Such is that of Toloom, which we subsequently visited. It consists of a large quadrangular court with arcades round it. On one side the arcade is five bays in depth, and separated from the court by a wall, thus forming a building similar to a basilica. This is the primitive type of mosque. When the impostor Mahomet built his first house of prayer at Medina, no doubt he took for his model the Casba where his fathers worshipped, and after he had purified the latter spot and overthrown its idols, no doubt it became the mother of all mosques, especially as he taught that it was founded by Adam after the image of the house of prayer in the heavens, which he said was situated immediately above it. The plan was simple in the extreme;—a square enclosure, with

arcades all round, and a small building in the form of a cube in the centre. Subsequently when the *Successors* took possession of Damascus and Jerusalem, they found models for their mosques in the Church of Constantine and the Basilica of St. John. Accordingly we find that all the larger and earlier mosques in Cairo are upon the Basilican plan, and that it is only those that were erected after conquest of the whole of Asia Minor had familiarised the Moslems with the Byzantine churches, after they had seen the greater advantage of the cruciform plan, and the convenience and beauty of the dome, which they thenceforth adopted as the characteristic feature of their architecture, that were after the Byzantine fashion. But the inhabitants of Cairo never took kindly to the Byzantine plan. With the exception of the mosques of Sultan Hassan and El Ghoree, and a few others of the sixteenth century, which are on the cruciform plan, all the principal mosques, such as Toloom, El Azhir, and El Hakem, are built upon the primitive plan.

The Mosque of El Azhir is a Mahometan university; its spacious court, which is 250 ft. square, is divided into seventeen schools for the instruction of Moslems from Arabia, Morocco, Turkey, Nubia, and elsewhere. At one end of the court is the mosque, which has eight ranges of columns, numbering, with those of the quadrangle, 350, most of them with ancient capitals and bases. The gate has two trefoliated arches, exactly like thirteenth-century Gothic. We attempted to get into this mosque, but were repulsed by the fanatical gatekeepers.

But it is not in Cairo itself that Saracenic architecture is to be seen in its perfection: outside the gates and at the sides of the citadel are two extensive cemeteries, and in the midst of these are to be seen, a mile or two from the city, groups of domed tombs, with mosques adjoining them, and minarets of the most picturesque forms imaginable. These are commonly known by the names of the Tombs of the Kalifs and Mamelukes; and many of them bear the names of their founder, such as the Mosque of Kait Bey, and that of Imam Chafei. Those on the north side of the citadel are the most numerous. They consist of eight or ten domes, supported by square basements canted off at the angles. These domes are all pointed, stilted, and bulbous in form; that is to say, they are narrower at the springing than a little above it, and they are all, more or less, decorated externally with ribs, lozenges, or arabesque patterns cut in the surface of the stonework. The minarets are also of various forms, but most of them resemble those in the city, being some square below and octagonal above, with three or four corbelled galleries. On the upper stage there are small columns at the angles, and their summits have the termination like a pear with its stalk upwards. In the narrow streets of Cairo one has almost to break one's neck in order to get a sketch of the domes and minarets, but here they can be seen to the greatest advantage, and sketched without molestation.

Besides the mosques there are numerous buildings of interest in Cairo, such as the baths and bazaars; but as there are no architectural peculiarities about them,—the former consisting of a series of square chambers, lighted by bull's-eyes in the domes, and supplied with hot water and steam *ad libitum*, and the other being merely arched or covered passages,—we need not waste time in describing them. If the traveller should, after a few days, tire of Cairo and its old-world ways, and should wish to be refreshed by a glimpse at green foliage and an image of civilisation, let him make an excursion to the gardens of the Khédiveh, at Schoobra. A pleasant drive of three or four miles through a magnificent avenue of over-arching sycamores and acacias will bring him to the gates of the palace of Schoobra. This he will not care to visit; but in the garden he will find a collection of all the flowering and other shrubs of Egypt, and in the centre of all he will see a kiosk. If he be an optimist who believes in the civilisation of the Mahometans, he will be gratified to see the interior fitted up like a Parisian boudoir, and handsomely bound editions of great writers upon the table. If, however, he be accustomed to Eastern ways, he will only perceive in this a sign of that Oriental politeness which aims at pleasing the eyes of visitors, and will not be a whit the more convinced that civilisation is compatible with a belief in the Koran.

There are many other interesting excursions to be made in and around Cairo. Boulak, the island of Rhoda, and other spots, may be visited without difficulty by any one who will trust himself to the guidance of a member of that institution of Egypt, the donkey-boys, and who will be content with the smooth paces of Ginger Pop, Yankee Doodle, or Lord Dundreary. He will not learn much from his guide, but will be amused by his stereotyped English phrases, and will be able to amuse himself by observing the manners and customs of the Arabs, which he could hardly do if seized upon and lionised by an enterprising dragoman.

But if he should venture on an excursion to the Pyramids on donkey-back, as we did on gentle Ginger Pop, we counsel him not to go without the escort of that necessary evil, the dragoman, or he will be almost torn to pieces by the Pyramid Arabs, who never can be brought to believe that they have had *backsheesh* enough: beginning with politeness, they end with menace; and if they get a solitary traveller inside the King's Chamber, are not likely to let him get out without paying a king's ransom.

GLEANINGS IN GLASTONBURY.*

THE wall arcades both within and without the Chapel of St. Joseph are designed with exquisite taste on a par with the beauty of their execution. Each shaftlet, no doubt a Purbeck monolith, was set upon a curved channel sunk in the wall behind. "The artifice," says Willis, "gives a lightness of effect, by providing a free space between the shaft and the wall, and at the same time enables the shaft to be set nearer to the wall." It is closeness and compactness, we would say, rather than lightness, that is aimed at and effected. The shafts carry round arch mouldings, which do not interlace, but rather interfere, their plain faces being continuous on the same plane, and confluent also on the same, at the crowns of the arches, with the horizontal string-course under the windows. The arcade thus escapes any appearance of a mere surface application, and asserts a true organic articulation with the body of the building. The intrados of the arches carries the toothed zigzag, so well executed and accurately divided, that the members exactly fit both the effective pointed arch between shaft and shaft, that is brought out by the arrangement of interference, and the segmental division that re-appears above. The flatness of these arch mouldings is in excellent harmony with the sobriety of projection that reigns in the pilastral buttresses, the angle turrets, and the corbelled cornice.

The west front of the chapel, escaping all the confusion of buttresses, has a group of three round-headed windows, the central larger and taller, set symmetrically above the continuous series of arcade arches. There is an appearance, however, in the disintegrated ashlar below the central window, that the series of shafts, though not of the interfering arches, was originally partially divided by some architectural attachment,—a niche or shrine.

The heads of these triplet windows appear to be either parts of semicircles, or rather, perhaps, describable as flattened semicircles. They are enriched with forms of what may be called reeded zigzag, descending on shaftlets. The patterns of the sides differ from that in the centre, and it seemed to me that their places might have been with advantage transposed.

Already, on the exterior, we are struck—if we indulge the sentiment of art for a time, and leave aside veneration for antiquity,—with a disharmony which will obtrude itself again in the interior,—a conflict of form between the round and pointed arch. It were futile to fall back upon obsolete speculations as to the origin of the pointed arch, from the interlacing of round Norman arches, but it were no less futile to ignore how the development of semicircular arcuation evolved of necessity forms of pointed arches, and so introduced of its own motion a discord that, had all other influences held aloof, must necessarily have led—if ever the true sentiment of style were given to the world—to the ultimate predominance of the form that, other advantages apart, was susceptible of independence from its endless susceptibility of variation. The tallness and closeness of spacing of the shafts of the wall arcades cause the lines of their arches to intersect at a most marked acute angle, and this form is emphasized by the continued zigzag moulding of the meeting limbs on the same plane, while the semicircular outline of the extrados is left to be inferred among the confluent mouldings, or intimated at most by an incised line. This effect is still further exaggerated in the still taller proportions of the arcades that ornament the free turrets.

In the interior the intrusive form obtains all the additional force conferred by predominant magnitude.

To judge by the traces of the wall arches, the height of the interior scarcely exceeded from 30 ft. to 32 ft., and the vaulting ribs sprung from the abacus of a triplet shaft, ranging with window cills at about half this height. The chord of the diagonal rib of each severy, about 25 ft., seems, as nearly as possible, equal to the width of two severies. The dimensions of the interior being thus:—Length, 50 ft. to 53 ft.; breadth, 23 ft. to 24 ft.; height, 30 ft. to 32 ft. These limits, which do not pretend to exactness, as taken from a diminutive plan, are quite near enough for our present purpose.

We regard it as certain that the diagonal ribs, the widest arches in the building, were true semicircles. Crossing, as they do, towards the walls at an acute angle, the consequence is necessary that a wall arch enclosing the windows, to reach the same height, and starting from the same level, must be pointed, and such accordingly is the trace that remains inscribed upon the side walls; still more importantly the main transverse ribs which commence again from the same level, and have to reach the same height from a smaller chord as necessarily meet in a point; the vista down the chapel, therefore, from end to end, gave ever the section of a pointed arch, no less than the transverse aspects, and the outline of this arch remains again upon the western wall, enclosing in its large sweeps the triplet round-arched window. The diagonal ribs have only roll mouldings; the transverse rib is much more important, and bears a bold combination of rod zigzag upon a semicircular core between pairs of smaller roll mouldings on either side. The vista of pointed arcuation was thus defined with the greatest force.

The pointed arch has thus by mere spontaneous evolution, and as if apart from design, and to the fatal detriment, indeed, of the style which has led up to it, acquired irresistibly the upper hand; it has only to invade the windows, which are still at present exempted through inveterate tradition, for the victory to be complete. It might, however, have been long indeed before this last step was taken, but for the influence of bolder geniuses who dared to anticipate,—to precipitate evolution,—by revolution. These are the men who seem to make opportunities, but, in truth, obtain their advantage by being ever expectant and on the watch for them; who not only catch sight of a new principle at its very first emergence, but who are gifted with imagination co-operant with power of logical deduction, to recognise all that it implicitly condemns and abolishes, and much, if not at once all, that it postulates and promises;—men who are gifted, moreover, with the courage to press a principle at once to its uttermost consistent application, break with whatever tradition, set aside whatever authority they may. Many influences concurred, no doubt, to the early developments of the Gothic style; it were vain to exclude the Eastern influence from ecclesiastical architecture at the very time when the philosophy of Averroes was reacting with such vigour upon ecclesiastical study. So much the greater was the merit of those who welcomed materials from any quarter, but modified all in subjection to one vital principle which it was their glory to have divined. It was in France that the Gothic system was first truly harmonised, and it is difficult not to be struck by the contrast of the progress of the style as between France and England, and as in a degree characteristic of the nations.

The spirit of progress is alive in both, but the spur in one case is somewhat overplied, and in the other, shall we admit it, the curb. Tenacity of precedent has here to be responsible for delays and incongruities that elsewhere are escaped in virtue of ruling avidity for novelty, albeit at expense of many a stumble. Of two competitors eager for advance, one will give up nothing without a compelling reason, and the other will retain nothing unless under compulsion. System is the first requirement of the one whatever has to be sacrificed; it may be no less the ultimate aim of the other, but the risk of sacrifices meanwhile, is sorely appreciated.

* See p. 21, *ante*.

In St. Joseph's Chapel, we see the round arch architecture fairly taken by surprise by the self-generated pointed arcuation, and the incongruous forms are left together with no attempt to relieve the incongruity. The architecture ought scarcely to be styled, as it usually is, advanced Transition,—it is rather a case of primary and frank Collision. When we pass to the remains of the abbey beyond, we still encounter incongruities scarcely less harsh; but this is no longer because the pointed arch is obtrusive in advance, but from the reluctance, the recalcitration of the Norman style in its necessary retreat. In the happily preserved chapel of the north transept fully developed Early English details are associated with the toothed zigzags of the Norman chapel in most elaborated combinations, very exactly worked, but not more out of harmony in outlines than in excess of massiveness relatively to the slender shafting; in the remains of the aisles, we see that if the pointed arch is adopted for the windows within, they are inclosed on the exterior (so the architect solaces resolution) by a semicircular.

The architecture of the chapel of St. Joseph, so called,—in reality the *vetusta ecclesia*, the church dedicated to the Virgin,—marks its own date most characteristically at the very crisis that transferred the rule of England from the Normans to the Plantagenets. The foundation itself was, doubtless, very ancient—as early as King Ina, at least; its importance is proved by the fact that the Saxon abbot of Glastonbury was one of the seven hostages that the Conqueror took with him on his first return to Normandy. His grandson, Henry II., after keeping the abbey in his own hands for some six years, laid the foundation of the new church in 1184. The direction of the work was committed to his *camerarius*, Radulphus, son of King Stephen. "He completed the church of St. Mary," says Adam de Domersham, "in the place where from the beginning the *vetusta ecclesia* had stood, building it of squared stones of the most beautiful workmanship, omitting no possible ornament." This praise, both of ashlar and ornaments, is fully borne out by the remains; the Norman zigzag receives here almost its last developments in many variations and combinations of toothed and bent rod zigzag. The patterns on alternate windows differ; among them are the ingenious examples that are introduced in the beautiful north porch of Wells, but there in union with Early English floriation, and surmounted by the exquisitely perforated drip moulding.

When we regard the broad contrast between Norman and Early English, we may be disposed to think that never was a transition so sudden and complete—scarcely that which we know and some revile, as the Renaissance. When we pass and repass from the chapel at Glastonbury to the abbey, and to the cathedral of Wells, we may be sometimes disposed to think that never was transition more prepared and inevitable.

Whichever view we incline to we must recognise with admiration the architectural genius that carried through the change so rapidly, and, with whatever occasional hesitations and inconsistencies, to a point of such high comparative completeness at last.

In this last Norman work under the first Plantagenet, we have lively promise of the refined and elegant style that was imminent; we have notice, too, of a difficulty that in England at least was scarcely effectively surmounted. This work is very closely of the same date as the round church of the Temple in London, and when we compare the Early English church which was attached there, we cannot but recognise a sympathy where we would willingly have missed it.

At Glastonbury the height of the vaulting shaft does not exceed, perhaps does not even equal, the vertical height of the vault, and the general effect could not but have been that of lowness and oppression, of heaviness and confinement; the spring of the ribs so low down as from level of window-sill necessarily brings the groins of the vault so much in front of the upper portion of the windows as to interfere with both the view of them from the end of the church, short as it is, and the diffusion of light.

We may also notice a carelessness of articulation of the side and transverse walls, that declares itself indeed often much more unpleasantly in the Early English structures of very high pretensions. In the angle of the interior there is only a single shaft which receives the diagonal rib, and there is no trace over the triplet-window where the outline of the vault is inscribed,—of any transverse, which would here be a wall-rib,—to correspond with the broad and boldly-moulded transverse ribs of the bays. The result is a failure of emphasis at an important juncture and termination where its requirement does, indeed, receive an acknowledgment, but quite illusory, in a slight modification of the base.

When the crypt was inserted in the fifteenth century within the lines of the foundation, as is so satisfactorily proved by Professor Willis, the pavement was raised to the level of the bench-table that carries the bases of the wall-arcade and vaulting-shafts; and thus the original defect of lowness was still further recklessly enhanced.

The flat pilastral buttresses terminate with an oddly-moulded attached finial some distance below the external cornice. The point at which they terminate may have reference to their implied service to the vaults within; but their summits range with no visibly expressive line,—no feature that betrays such organic dependence; and, in the absence of any hint of reason why they went so far or stopped when they did, the effect is inevitably inconsequent and frigid.

Professor Willis says they end "with a corbel, which probably carried an image;" but this we seriously doubt.

The round recessed north door of the chapel has a roof-shield moulding above it, very depressed, and leaving the least possible vacancy between the crown of the extrados and the apex of the shield,—an intimation of the probable and commendable parsimony of vacant space between the lost roof of the chapel and the vault.

THE STRUCTURAL UTILITY OF IRON.

RECENT incidents cannot fail to awaken a certain degree of interest in architectural and engineering circles, apart from that which is associated with the fracture of the Holborn Viaduct columns. In accordance with the conclusions of those whose opinion in such matters is regarded as deserving every attention, it would appear that the perishable nature and properties of iron as employed in static engineering no longer forms the principal object to be considered in reference to its utility or value as a building material. The decay to which iron is exposed from atmospheric changes and by variations of temperature has long been within the knowledge of many, and more recently the transitional qualities which iron and steel have been observed to possess, have attracted more general recognition. The molecular aggregation and dissociation of iron have been demonstrated to such a point of clearness that the material may be said to be capable of being held in atmospheric tension more eminently, perhaps, than any other substance employed in building. In addition to this circumstance, the molecular capacity of iron is known to be such as to admit of essential changes of its properties and functions. The same bar of material would, in accordance with the varying conditions of its employment, exhibit all the features and elements of new and distinct substances. The freedom of motion to which the constituent elements of iron and steel are known to be susceptible admits of the presentation of various orders or classes of fracture in the same sample, and the nature of such fractures may be said to determine the practical limits of the adaptation of iron as one among the materials of construction.

The sudden fracture of railway-carriage axles is sometimes attributed to a change effected in the material by vibration. After subjection to vibratory tests, a bar of fibrous iron has been observed to have completely changed, presenting a granular or crystalline fracture it may be; and it is equally possible that a crystalline or granular sample should, under certain conditions, acquire the properties and features of a fibrous specimen. The singular atrophy, or withering away, to which iron, under some circumstances, is liable, and of which a familiar instance may have been noted on the part of many at the base as well as in other parts of iron railings, may readily suggest itself. Although an incident probably in a measure now obviated, and comparatively of but little moment, such exhibitions, notwithstanding that they may be said to be capable of being effectually remedied, invite special observation on the part of those who may be led to widely adopt the employment of iron in construction.

It might be unavailing, if not altogether devoid of interest, to single out the more trivial and fortuitous examples of the speedy decay to which the material under consideration is occasionally seen to arrive, but the total and intrinsic degeneration of such a substance by its mere proximity to others, whatever the process through which such a result is reached, is a subject possessed of unequivocal claims to investigation. In alluding thus prominently, it may be viewed by some, to what may be open to be regarded as the more unfavourable elements of this question, we would be understood as far from discountenancing the application of iron in a constructive direction. Many circumstances, however, we incline to think it would be agreed, contribute to indicate the necessity of some selection as to those conditions under which its employment would become more appropriate and effectual.

Upon the completion of many important erections in which iron is seen to have been largely employed it is by no means an infrequent occurrence to observe that opinions are in certain directions at once set in motion, to the detriment of the undertaking in many instances, it may be gratuitously, but in the general result uniting to diminish the assurance of the public with reference to the stability or safety of such structures.

It has upon some occasions unhappily proved too well founded that substantial grounds may have existed for some amongst the numerous deductions to which these speculations are likely to lead, while in other instances the conclusions which have been derived have been altogether disproved or shown to have been unfairly or unduly exaggerated.

It is a matter confessedly of such difficulty, even in engineering circles, to assume an unconditional responsibility with reference to some of the reputed properties of iron, that a tendency has declared itself on the part of those more intimately interested in that science in connexion with which its structural use is so closely associated to endeavour to discover continually improving and more favourable modes of its application.

It is this latter view of the subject probably which may be considered to possess more special claims to the notice of our readers, nor should it be omitted to be conceded that in entering into a more critical examination of what few would probably treat as altogether unimportant the modest pretensions which have been put forward on the part of the engineering profession are calculated to invite considerable forbearance, and may happily induce the supposition that the authority which age and experience can alone impart to the principles of any art or science may be expected to operate in its favour as it has done in many analogous instances.

Perhaps the most complete and authoritative inquiry which has yet been made with reference to the utility of iron for purposes of construction is that which was instituted some twenty years ago before the committee for inquiring into the application of iron to railways. Since the time at which those investigations were conducted, the theory of the structural utility of iron has sought to embrace such conditions, and the processes of the manufacture of that material have undergone such modifications, that in the future interests of architectural, no less than engineering, science, it would appear far from undesirable that some similar inquiry should now be established.

The important experiments upon the properties of iron and steel which we owe to Mr. Kirkaldy, and to which we had occasion to allude in a notice of Mr. Bindon Stoney's lately-issued work "On the Theory of Strains in Girders and similar Structures," would almost of themselves suggest the wisdom of further legislative inquiry; for while manufacturers and public alike may appeal, in a certain measure, to the results of such experiments as likely to exercise a salutary check over the constructive application of the materials in question, it is the result of a purely voluntary and promiscuous system.

It may be fairly questionable whether the subjection, say, of the whole series of links of a suspension bridge to a fixed and arbitrary strain, is calculated to enhance the stability of such structures when erected.

Mr. Stoney, in stating that the functions and properties of iron become changed after its subjection to various strains, has recorded what has long been known perhaps in a less determinate form. Whatever may chance to constitute those obscurer qualities in iron and steel to which attention is attracted upon the occurrence of unexpected ruptures or disasters through the employment of those materials, it is obvious that they appear calculated to afford important

constructive facilities, and will always invite employment in some building capacity. It is of practical moment, therefore, to the architect to seek to bring under more critical examination the occasions of failure in either of those materials in their structural application. The fall of the Manchester Station roof, some two or three years ago, it may be remembered, was attributed to a flaw in some portion of the casting; while the more recent instance of the Caledonian Station has been laid to the account of a tie-bar giving way; and in the case of the Ludgate-hill Station, the accident was referred to the simple misplacement of a strut.

It is with no intention of imparting an undue importance to such incidents that we make reference to occurrences some two or three years old, but the integrity of an extensive undertaking, it may be in iron, has been so frequently traced to, and imperilled by, the giving way of some trivial support, or member of the general structure, that the circumstances may demand pointed observation in any further inquiries into the strength and adaptation of such materials. In reference to novel discoveries in static engineering and attempted improvements in the application of the materials with which that science is identified, it cannot but afford matter of congratulation to notice any instances where it may have been more clearly shown that undoubtedly successful results have been attained.

Although the extraneous successes of certain engineering experiments may be said to possess less interest in architectural circles than where it has been sought to import similar endeavours into the domain of architecture, it must necessarily be of interest to note those claims which are occasionally alleged upon special grounds, with reference to the allied arts of construction. Apart from the employment of iron, so obviously has the theory of engineering been necessarily founded upon certain of the principles of architecture, that a sense of usurpation reigns in engineering circles wherever the distinctive element is more notably absent; and this it is which, in the opinion of some, might be held to shed light upon the assertion of an eminent member of the profession, that it has been very unsatisfactory to attempt to describe in a few general words what a civil engineer really is.

As an illustration of the more unfixed elements upon which the art of construction in iron is yet based, reference might be made to the evidence which was given by Mr. Robert Stephenson before the Committee of Inquiry, upon the application of iron to railway structures. The report of this Commission is known to be still regarded as of high authority in engineering practice, and the circumstance may be noted with all the more pleasure, as instancing the undoubted progress which has been made since the time of the inquiry in the profession to which it relates.

Upon being asked as to his opinion with regard to suspension-bridges, and whether he considered them at all applicable to railways, Mr. Stephenson replied, "To a very small extent. I do not think, with the prospect of our weights increasing upon railways, that you can run a locomotive over any chain-bridge in existence."

We have already had occasion to advert to the opinions which have been derived by Mr. Edwin Clark as to the construction of suspension-bridges, wherein he expresses his belief that the erection of a suspension-bridge sufficiently rigid for the purposes of locomotive traffic would be tantamount to the construction of a tube. Mr. Peter Barlow, whose experience in the structural application of iron entitles his opinion to great weight, is at issue with Mr. Clark, and remarks that, "although unsupported by fact or experiment, Mr. Edwin Clark's theory has been received and acted upon, not only by a large portion of the public, whose impressions of suspension-bridges are derived from what had hitherto been constructed of insufficient strength and without being combined with a girder, but it had been received and acted upon by engineers of eminence in this country."

In the inquiry before the Commission to which we have alluded an important exception was taken by Mr. Stephenson in favour of a system of suspension bridge which at that time attracted considerable notice. The discovery invited such attention that Lord Western was induced to communicate at great length with Viscount Melbourne as to the superior applicability of the system to the repair or renewal of the Menai Bridge, deducing from actual experiments its merits in bridges of large span. This class of structure is known as Dredge's Patent Taper Suspension Bridge. Lord Western observed that the inventor insisted on the possibility of reconstructing the ironwork of the Menai Bridge at a less sum than the superfluous iron would sell for, pledging himself to the power of the bridge if the irons were altogether altered, using Lord Western's words, and reconstructed on his principle, to be capable of supporting on transit 1,000 tons.

The main principles of the Dredge suspension-bridge would seem to be comprised in the employment of pyramidal suspension-chains, and the substitution of oblique for vertical rods for connecting the suspension-chains with the roadway. The invention of Mr. Dredge, with reference to the application of iron in the erection of bridges more particularly, was supposed to embody such important structural principles that, apart from the exception which was made in its favour before the Commission to which we have referred, it may now upon various grounds be found to possess further claims to practical consideration.

The Dredge principle is stated to have been founded upon the view that bridges are only brackets, and should be dependent upon their bases or abutments, and the strength of the material of which they are constructed, like the human arm, which depends on the shoulders, and not on the fingers' ends, or the limb of the oak, which is sustained by the larger part of the branch that grows from the tree, and not by the ends of the twigs at its farthest projection. Bridges have hitherto been made to rest on their centres, as beams in architecture, and hence the superfluous material in them, with the immense accumulation of leverage that exists on their centres, is the cause of their undulation and destruction. In a common bridge, whose depth is one-twentieth of its length, and the weight 1,000 tons, the central forces are computed at 5,000 tons, instead of which no description of force or weight, according to the Dredge principle, should exist on the centre of the arch of any bridge, for it is but the extremity of two projections. The operation of the system is therefore in the direction of the annihilation of these static forces, which of themselves tend to destroy the structure, and to counteract which an excessive quantity of material must necessarily be employed, in accordance with more usual practices. One of the more important elements in connexion with the erection of all suspension structures of the nature in view has been the acquisition, at the least cost, of the maximum rigidity, and to accomplish this various expedients have been suggested and employed. In the original suspension-bridge which existed at Hungerford Pier, in the line of the present Charing-cross Railway, the lateral motion, as well as the deflection, of that structure under passing and unequal loads was remarkable. In that case, as in the present Hammersmith and Chelsea bridges, the roadway was attached to supporting-chains by vertical rods; but in the substitution of oblique bars in the Dredge system, considerable rigidity was supposed to have resulted. A more special treatment of this element of bridge construction may be noted in Koch's system of suspension, a class of structure perhaps deserving of fuller notice than it has yet received; but the more conspicuous instance is that to be observed in the stiffening which has been imparted to the Niagara Railway Bridge by means of timber trussing following up the direction of the chains. This feature has been reproduced in Lambeth Bridge, iron being there, however, substituted by Mr. Barlow for the timber, as employed in the Roebling system. In most of the instances which we call to mind the metallic section of the supporting-chains has been uniform at any point along the span, nor do we remember any case of such singular deviation from this principle as that to be noted in the pyramidal chain-bridge. The attempted economy of material towards the centre of lattice girder bridges may faintly shadow out the principle involved, and we cannot resist the impression that an exaggerated view has been taken as to the possible saving of material as between the Dredge principle of suspension and others. Perhaps the most exquisite adaptation of iron to structural purposes—that is, in a useful sense—to which we may refer, is instanced in the case of the London, Chatham, & Dover Railway Bridge, erected at the crossing of the Thames at Blackfriars; but it seems unhappily possessed of fewer lasting elements than its present neighbouring structures.

The results of the experiments which were communicated by Lord Western to Lord Melbourne, upon the distinctive features of the Dredge bridge would appear well calculated to attract the attention of the scientific; but, as we have before had occasion to notice, the extreme divergence of views entertained by the more eminent professors of engineering detracts from the value or importance, in a measure, of individual conclusions. Whether greater triumphs may be derived from the application of wire cables, assisted by vertical and horizontal trussing by the system of pyramidal chains and oblique suspension-bars, or by the tubular system conjoined with chains, or in the form of tunnels, we would be indisposed at this moment to venture to predict; meanwhile attention is being attracted to more recent discoveries as to the structural application of iron and steel. Out of the mass of conflicting and antagonistic evidence with which the theory of engineering is obviously beset, it would afford matter of congratulation should some settled principles be evolved, and it is because we incline to the view that at length some tendency in this direction may be detected, that we would seek to bring under notice some few of the more striking features of that art.

INSTITUTION OF CIVIL ENGINEERS IN SCOTLAND.

THE address of the president, Professor Macquorn Rankine, has been published: we take from it two or three passages:—

Sand Concrete.—It has long been known how greatly the execution of breakwaters, and other harbour works and sea defences, is facilitated by the use of blocks of concrete instead of natural stones; because such blocks can be made of any size that may be required in order to resist the force of the waves. It has lately been shown, by the mode of construction used in the breakwaters of Port Said, at the northern end of the Suez Canal, that such concrete may be made of hydraulic lime and sand alone, without gravel or stones.

Ventilation.—A branch of sanitary engineering not less important than water supply and cleansing, is ventilation; but its difficulties and imperfections are in some respects of an opposite character. In the branch which deals with liquids and solids, we find that the supply of pure water is comparatively easy, while the removal of refuse involves matters of dispute and perplexity. In the case of ventilation, on the other hand, appliances for the removal of foul air are well known and extensively used; while the supply of fresh air, though in some cases efficiently provided for, is in other cases neglected; and there are too many instances of the latter class. We too often see large and splendid public halls, in which outlets for foul air have been most carefully planned and executed at various points of the roof, while the supply of air has been left to the casual opening of a door, or to the currents which the pressure of the atmosphere may cause to enter through drains and soil-pipes, or down disused chimneys. There are many exceptions, however, to this remark to be found in buildings where the supply of fresh air has been amply and skilfully provided; and the number of these exceptions is fortunately increasing. Care should be taken not to under-estimate the supply of fresh air required by the inmates of a building: experience has proved that each individual requires at the very least 20 cubic feet per minute, and that if possible he should be supplied with 30 cubic feet.

Engineering Education.—The movement which is now so active for the extension and improvement of technical education, is one in which the members of the various branches of the engineering profession are deeply interested. The objects carried out by those who promote technical education may be classed under four heads: providing teachers, providing buildings, providing the materials of instruction, and providing scholars. A step was made by the Government about thirty years ago towards the providing of teachers of the scientific principles of engineering, by the founding of chairs of civil engineering and mechanics in some universities; amongst others, that of Glasgow. The efforts of the holders of those chairs met but with partial success, until their teaching was made to form the conclusion of a systematic course of instruction in the various sciences bearing on engineering. After that systematic course had been established, the students steadily increased in number, diligence, and ability. More recently much

has been done to increase the number of teachers; and I may mention, as specially worthy of honour, the establishment by the Government of the Royal School of Naval Architecture and Marine Engineering; the contributions of the inhabitants of Manchester towards the endowment of Owen's College; and the foundation, in the University of Edinburgh, by Sir David Baxter, with aid from the Government, of the most liberally endowed chair of Civil Engineering in the United Kingdom. As regards the provision of buildings, I know of no instance of munificence to be compared to that of the inhabitants of Glasgow and its neighbourhood. The amount of their subscriptions to the fund for the new University Building, taken together with the Government grant and with other resources, has enabled that building to be executed on a scale which will provide most ample and convenient accommodation for the engineering department, as well as for other branches of study, which have hitherto been conducted, in the old College, under great disadvantages as to space, light, and air.

The objects which give the most important aid to instruction in engineering science are those examples of materials and workmanship which are to be seen in actual structures and machines. Nevertheless, a good collection of specimens of engineering materials would be of great service in connexion with the engineering department of a university; and so also would a collection of models, drawings, and instruments, though less important than specimens of materials.

It is only necessary to name to you Sir Joseph Whitworth, in order to remind you of the magnificent endowment which he has provided for students of mechanical science and practice combined.

It is evident that the value of scientific education to engineers is at the present day duly appreciated, and that the means of obtaining it are being rapidly extended, and indeed are in many cases promoted with enthusiasm. Just as in every similar case, in which a good object is earnestly pursued, there are errors against which it is necessary to guard. One is, to expect results from the scientific branch of education which it is not really capable of accomplishing. The purely practical parts of engineering, such as the use of tools and the superintendence of work, cannot be soundly and thoroughly learned except through experience in real business; and it is a mistake to endeavour to teach them during a university course. The true laboratory for students of engineering science is to be found in the workshops of such cities as Glasgow, and amongst the earthwork, masonry, carpentry, and ironwork of engineering structures in progress.

THE EARLY YEARS OF RAILWAYS.

MR. VIGNOLES'S ADDRESS.

WE quoted in our last a portion of the address delivered by Mr. Chas. B. Vignoles, F.R.S., as President of the Institution of Civil Engineers. It contains so much that is valuable that we are tempted to make some additional extracts:—

Passing over intermediate years, let me come to my proper task and attempt to recall some of the memorable chain of occurrences, in the earlier days of the railway system, when that grandest improvement among the many ameliorations of the first quarter of this nineteenth century began its earliest struggles for general adoption. It is to the courage and enterprise of the mercantile and manufacturing communities of Liverpool and Manchester that we owe their introduction, and benefits such as we have enjoyed during the last forty years.

The trade to and from the port of Liverpool had long been outgrowing the existing means of inland carriage. The two great carrying companies, popularly known as the "Duke" and the "Old Quay," had provided it with water transports during three-quarters of a century, as, for a shorter period, had the "Leeds and Liverpool Canal;" and the many wagoners along the rough paved highway had supplied the road conveyance. But it may readily be imagined that, with the rapid increase of commerce subsequent to the close (in 1815) of our long series of wars, all of them were insufficient.

When the first steam-engine had only been erected in Manchester in the year 1790, not a power-loom had been introduced until twenty years later, and the population scarcely 40,000; when the port tonnage and population of Liverpool were small—when the first casual importation of eight bales of American cotton in the year 1784 was so strange that it was seized by the Customs officers, under the conviction that it could not have been the produce of the country which the invoice stated it to be; the trade of both towns was unimportant compared with that of 1824, by which time Manchester had 150,000 inhabitants, 200 steam-engines at work, and 30,000 power-looms employed; then dock-dues at Liverpool were paid by 10,000 vessels, the population was 135,000, and upwards of 400,000 tons of cotton were imported yearly; goods in transit between Liverpool and Manchester equalled fully 1,200 tons daily, besides upwards of a million tons of coal carried annually into those two towns. Thus the aspect of commercial affairs had totally changed, though the means of conveyance remained unaugmented and unimproved: hence arose vast pressure and enormous sacrifices to ensure speed and certainty in the delivery of goods. This could only be done by land carriage, sometimes at almost ruinous cost. Some remedy was imperative, some competition indispensable, and the inquiry became necessarily limited to the form in which it should be devised and applied: it was not long before deciding that the remedy should be by means of a railway.

Railways, though rude, had existed in the coal counties on the Tyne and the Wear for 200 years previously, but since the beginning of the present century they had improved and multiplied rapidly, but were still only short isolated private undertakings, appropriated exclusively to the transit of coal. In 1822 the first public railway for goods, coals, and passengers was proposed between Stockton and Darlington: it was unsuccessful in Parliament from the opposition of the landowners and coal proprietors, but next year the Act was obtained. About this time, William James, a London engineer, had suggested just such another railway to the mercantile men of Liverpool, to supply the great want of conveyance between Liverpool and Manchester, and James made the first actual survey. It was not adopted, but the idea was entertained and ripened. The water-carrying companies refused to reduce their tolls, the alternative of road conveyance was impracticable, from its limited resources and great expense; but independent of tolls, the endless delays on the canals, the pilferage of the merchandise in transit, and the terminal obstructions from want of space, left no hope of improvement; and in 1824 the first prospectus for the Liverpool and Manchester Railway was issued, the appointed committee prepared their plans under the advice and direction of George Stephenson, and lodged them for application to Parliament in the ensuing session.

The anticipated strenuous opposition to the scheme was not long in becoming realised. The three bodies of canal proprietors, each in itself no despicable opponent, forgetting their mutual animosities and former disagreements, banded against the new rival in formidable array, acting on common impulse, organised under most skilful direction, upholding with tenacity their vested interests, claimed as rights; and prepared at all hazards to resist and crush down so intolerable an innovation on established modes of communication, and on their chartered privileges and long-maintained monopolies.

Two noble peers, Lord Sefton and the great-grandfather of the present Earl of Derby (whose estates the railway crossed, and have since so vastly improved those belonging to the latter nobleman), made common cause with the canals to prevent the passing of the railway bill. It was battled during three months through the House of Commons. Every possible objection was taken. Imperfect plans, erroneous levels, interference with parks a mile distant, danger, nuisance, and incompetence of locomotive engines, deficiency of estimate, impracticability, especially in crossing Chat Moss. One very eminent engineer affirmed that the probable expense of crossing that moss would exceed 200,000l., though the real cost was actually within 30,000l.

I should inform those of my hearers, who have not watched the different changes which have taken place in the practice of passing private Bills through Parliament, that in those days committees on Bills, and even on standing orders, were open to every member of Parliament who chose to attend, were it solely for the purpose of voting upon the preamble or merely on a particular clause. *The whip* for the first division was tremendous. The preamble of the Bill was carried by a majority of *one* only in the open committee to which seventy-three members had been pressed. It must then have been considered hopeless to persevere; next day the clause, empowering the company to make the railway, was lost by a vote of nineteen to thirteen; the clause to take land was also negatived; the promoters then withdrew the Bill, and thus ended the first act of the great railway drama, which, even at the present day, is still far from being played out, although 100,000 miles of railway are now laid on the face of the globe.

Nothing daunted, the high-spirited committee, the very *élite* of Liverpool, called their parliamentary supporters together on the third day after the loss of their Bill, and, encouraged by them, resolved to persevere. And, hear it, my fellow-countrymen of Ireland, the most cogent argument used by the leading political men of that day who attended the meeting—an argument repeated in the new prospectus of the railway—was, the benefit which the railway would produce, directly and indirectly, to the agricultural interests of Ireland,—a benefit I can testify from my personal knowledge ever since, has been most abundantly realised; and, considering that it was an argument brought forward five-and-forty years ago, there is good ground for maintaining that the best interests of Ireland were then, as now, quite as much cared for as those of Lancashire.

It happened that I had returned, some two years previously, from occupations on the continent and in North America, both civil and military, all connected with engineering, occupying repeated absences from this country. Having watched the few railways then made, or making, I was fortunate in being selected by Messrs. Rennie to take charge of the new surveys, which the Liverpool committee immediately ordered under the direction of those eminent engineers. But the opposition of canal owners and land proprietors had become redoubled; and it was in the course of carrying out this duty that I was brought into contact with the celebrated Mr. Bradshaw, the devoted trustee under the remarkable will of that Duke of Bridgewater who employed Brindley to make his canals, and had charged Mr. Bradshaw with the sole and absolute control of them, and of his large estates, for the benefit of his future heirs, which he exercised for nearly half a century.

I was brought up before Mr. Bradshaw, at Worsley Hall, on a pretended charge of night poaching and trespassing; for I was often obliged to make surveys and take levels by moonlight and torchlight, so strict was the watch kept by day, by order of many landowners to prevent engineers from completing the necessary plans and sections. Mr. Bradshaw had contrived to earn himself a terrible name for severity, but I found him a gentleman. My only reason for recurring to such a mere personal adventure is, that some not unfriendly discourse passed between us on that occasion, which I communicated to the Liverpool committee. This led, I have good reasons for believing, to communications which, before the end of 1825, ended in those arrangements by which the then Marquis of Stafford, for himself and those of his family who were ultimately to benefit in the profits of the Duke of Bridgewater's canal, took 1,000 shares in the Liverpool and Manchester Railway Company, with the privilege of nominating three of the directors, arrangements confirmed by the company's first Act of Parliament.

On the 25th of September, 1825 (I note the special date) the Stockton and Darlington Railway was opened for public traffic. The surveys for the new railway between Liverpool and Manchester, commenced in the July preceding, were completed and lodged in November: then public attention awakened to such projects, and early in 1826 the Bill was again introduced into Parliament, under less discouragement. The opposition, however, though not so compact was as keen as ever, and the passing of so important a measure required every effort, every precaution, on the part of the promoters. The leading counsel opposing was the late Baron Alderson, next to Sir Frederick Pollock, the most accomplished mathematician and man of science then at the Bar, prompted in his crucial examination of engineers by your esteemed past-president, George Bidder, then as well known for his marvellous power of mental calculation as he has since been as a scientific and practical engineer. Few of my audience will be disposed to infer, judging from his subsequent career, that my old opponent Bidder was the most formidable enemy of the railway in its first Parliamentary warfare.

In spite of him, however, the preamble passed the ordeal of committee, this time with a majority of 43 to 18. The third reading was opposed in the Commons by the illustrious Lord Derby lately deceased, then the Honourable Edward Geoffrey Stanley, who made his almost maiden speech in that House against the Bill, with all the ardour of his character; but on a division, the numbers were 88 in favour, 41 against. The struggle was renewed in the Lords' Committee. One of the counsel for the railway was William Page Wood, then a junior barrister, now Baron Hatherley, Lord High Chancellor, and a very near neighbour of ours. On their last day of meeting in committee thirty-two peers were present, when the very old earl and his son-in-law, Lord Wilton, were the only dissentients. The third reading was carried without a division, though not without hostile speeches; the Royal Assent soon followed, and on the 29th of May, 1826, a general meeting of the subscribers was held in Liverpool, and the newly-appointed directors held their first sitting on the following day. Soon after George Stephenson returned to the post of engineer-in-chief, and the railway works commenced, and were vigorously pushed on for three years, until approaching near to completion, when it became necessary to settle the question of the motive power to be used on the railway.

It would occupy the time usually assigned to more than one address, were I to pursue the interesting record of the steps taken to solve this question; but I am not attempting an historical analysis—merely selecting a few reminiscences. I should have been very glad to have noted the proceedings known as the "Rainhill Experiments," having been myself present the whole time, in October, 1829, when the competitive trial of locomotive engines took place, ending in the grand prize being awarded by impartial judges to George Stephenson and Henry Booth jointly. It is from Mr. Booth's publication that I have been most unscrupulously abstracting. I will refer those who may be disposed to enter into details of such remote date to the pages of the Liverpool newspapers and the *London Mechanics' Magazine* of that period. Trustworthy, impartial accounts are to be found therein, and full justice done to my old friends, Braithwaite and Ericsson, whose engine, the "Novelty," was long remembered as the *beau idéal* of a locomotive, and which, if it did not command success, deserved it.

A great gathering of engineers from all parts was, of course, in Liverpool; and, as Englishmen are said not to get on well on important business without dinner demonstrations, the engineers gave on this occasion a grand banquet to the directors and officers of the railway, and to the competing locomotive engine builders. Of course speeches were made and healths drunk, and we toasted each other and everybody, except the waiters. Will you excuse me if I read from a newspaper report of our feast (in the *Liverpool Albion* of the 12th of October, 1829), two short predictions of mine about railways. I had had the honour assigned to me of returning thanks for the toast of "The President and Institution of Civil Engineers," and what I said is thus reported:—

"Mr. Vignoles, as a member of the Institution, returned thanks for Mr. Telford, to whom, as the constructor of many of our most important public works, the toast was due. His (Mr. Vignoles's) first step in life was as a military rather than a civil engineer; and as he was deputed to propose a military toast, perhaps he might preface it by some anticipation of what steam would do, in a military point of view. Supposing such a general as Napoleon were to effect a landing on our coast with a large and powerful army, and that he even were to be victorious upon his landing, armed as this country is shortly to be with railroads and locomotive engines, brief would be his triumph; for by return of post, as it were, parks of artillery and the whole military force of the country could be poured upon him, without even the fatigue of a march. Mr. Vignoles concluded with giving 'The Master-General of the Ordnance and Corps of Royal Engineers.'"

And a little later in the evening, having had to propose the health of the three judges of the locomotive competition, I stated, as reported:—

"Being engaged in laying out a railway between Goole and Barnsley, he (Mr. Vignoles) hoped to see that accomplished and made part of the union between the two sides of the kingdom, and that it might put it into the power of that part of the country to supply the metropolis with the article coal, at present furnished through sea transport by the great northern proprietors, whose monopoly, he trusted, would then soon be put down."

As regards my latter prophecy, my friends taking them either in alphabetical or geographical order, Barlow, Cubitt, Fowler, and Harrison, have now pretty well realised what I uttered about bringing coal into London by railway, though they only began some twenty-five or thirty years after it was first thought about. Still it has been most effectually accomplished. In respect, however, of what railways would be able to do, in case of the momentary success of an enemy invading this country, I have to remark that one of the earliest duties required by the War Office, after the establishment of our Engineer and Railway Volunteer Staff Corps, was to point out the means by which, in the event of such a disastrous occurrence, the railways could practically protect us; and the answer we returned went to the effect of demonstrating that within forty-eight hours after the alarm had been sounded, the whole military force of the country could be poured down upon the enemy, on whatever coast the invading forces might land, without, excepting in a few limited cases, the fatigue of a single day's march. I would have asked our illustrious honorary member, Field-Marshal Sir John Burgoyne, whom I hope I may be permitted to call old friend (whose illness, I regret to say, has alone prevented him from doing us the honour of being present this evening), but in his absence I appeal to the Inspector-General of the Royal Engineers, Sir William Gordon, whom I am proud to see here, whether our replies were not complete and satisfactory, and whether what was thought at the time to be the mere boast of a dreaming enthusiast, is not now ready for realisation at any hour—though God forbid that that hour should come, even though it found us fully prepared, as forty years ago I ventured to anticipate we should be.

I am thus led to a subject which I had intended to mention previously, but here seems the most appropriate place. The civil engineers, as a body, were first so called by Belidor, to distinguish them from the military engineers. It may be readily understood, however, in how many cases the military professional operations would partake of the civil elements. On such occasions, when appealed to, as in several recent instances, we have always been most willing to give our military brethren any advice and assistance in our power, as has been repeatedly acknowledged.

But now a new era is coming upon us, which will bring us much more in connexion with the military service. First, by the organisation of our National Volunteers, in which we, as engineers and artisans, have largely partaken, giving to the movement our professional skill; and, secondly, in consequence of the general extension of railways, and the recent introduction of the new powerful arms and implements, none of which have been as yet subjected to any regular fully-devised system, even in the most recent wars but which will necessitate increased influence of engineering in military operations, the full consideration of which we, as civil engineers, including the most eminent of our body, are using our best efforts to develope; and we have the satisfaction of finding these efforts appreciated by military and naval officers of the highest distinction and experience.

I need scarcely say that a year or two before, and, of course, immediately after the opening of the Liverpool and Manchester railway,—the attention of the public generally had been drawn to the new system of locomotion; a number of projects were brought forward, and many more were in contemplation, especially a railway from London to Birmingham, and another from Birmingham to Liverpool; for amalgamation had not then become the order of the day. Among others was a plan for connecting London and Paris by railroad, viâ Brighton (or, rather, Shoreham) and Dieppe, the long sea transit not being then deemed so objectionable, considering the distance between the two capitals by this route was the shortest by sixty miles.

A powerful combination of capitalists was formed, and soon after the change of monarchy which placed Louis Philippe on the throne of France, I was sent over to negotiate for a concession in the French dominions. I had the honour of several interviews with his Majesty; the celebrated statesman, Thiers, then Minister of Public Works, was sent to England, and soon after M. Le Grand, his Under Secretary of State, came over. I had the honour of escorting them one after the other through the manufacturing districts and along the railways, some of which I was constructing, and I thought I had convinced them both of the advantage which the railway system would be to France.

After some considerable time occupied in inspecting everything which I thought most likely to interest these two chiefs of the Public Works of France, and conveying them over road and railway at a pace at which I am sure neither of them had ever moved before, M. Thiers took leave of me in a speech full of compliments and polite phrases, which I will attempt to paraphrase in plain English:—"Mr. Vignoles," said the accomplished statesman, but bad discriminator, "I am infinitely obliged to you, and I think you a very clever fellow, but, do you know, I did not believe a word of what you told me before I came, and now I cannot see the great advantages you were constantly dwelling upon. You have good canals—but very small, and ours in France are much superior. As for your roads, they are very good, but I have not met a merchandise wagon on them in the whole of my journeys. *I do not think railways are suited to France!*—And as to your vaunted posting, we go quite as quick in France." Perhaps this last remark was not to be wondered at, for M. Thiers had insisted on bringing over to England his own heavy lumbering vehicle, quite à la Louis XIV., with immense lamps, like the old Paris reverberators, at the four corners on the top of the coach, which carried heavy Imperials, and eight or nine persons in and out, requiring six horses most of the way.

M. Thiers returned to Louis Philippe, and reported against the introduction of railways. He made violent speeches in his place in Parliament as Minister of Public Works, adverse to them, and the benefit of railways to France was postponed for eight or ten years, of which M. Thiers has been repeatedly and sharply reminded by his political opponents, when lamenting his shortsightedness. But his deputy, M. Le Grand, was somewhat more reasonable. He left a staff of young engineers to study our system of road-making, and it was copied closely in all the new roads subsequently made, and the Macadam principle of repairing was adopted; and, in fact, from that period the roads throughout France have been changed, greatly for the better. I cannot but acknowledge that the way in which roads in that country are now kept up is superior to our own—especially as regards our mode of forcing good horses and light carriages to grind down broken stone. In France they keep many of the roads clear from mud in winter, and from dust in summer; and where road materials are scarce and dear, they find a great economy in doing so.

Mere politicians called upon to consider and judge of engineering naturally fall into errors which, if excused, cannot be easily forgotten; but what can we think, or rather what ought the engineers of France to think, of a system which placed at their head a statesmen, who, virtually, robbed them of the glorious opportunity of doing for themselves and their country what, after years of injurious delay, fell into the hands of English engineers and capitalists, they becoming the first practical introducers, on a large scale, of railways into France? A system, which, in my judgment, notwithstanding many advantages, hangs like a dead weight on the talent, genius, and invention of that country.

* * * * * *

STATISTICS.

1868-69.	United Kingdom.	France.	Prussia.	Spain.	United States of North America.
Railways (English miles)	14,247	10,362	5,603	3,831	42,672
Metalled Roads (ditto)	160,000	100,048	55,918	10,886	...
Navigable Rivers (ditto)	...	6,015	...	...	...
Canals (ditto)	3,000	3,154	...	...	...
Telegraph Lines (ditto)	23,165	23,830	13,881	6,922	...
,, Wires (ditto)	96,104	67,473	45,708	15,263	99,000
,, Stations (No.)	2,432	1,701	830	184	...
Post Offices (No.)	17,741	5,099	3,942	...	25,200
Letters (No. Yearly)	898,118,000	537,099,328	...	...	631,010,000
Newspapers and Book Packets (ditto	105,845,000	351,076,008	270,000,000	...	...
Area (English square miles)	122,519	210,460	139,675	198,061	3,591,840
Population (No.)	30,621,431	38,192,084	23,970,941	15,673,481	38,448,905

WHITEHALL AND VICINAGE.

THIS noble expanse, now extending from the National Gallery on the north, to Parliament-street on the south, is the most spacious, and, from its central position, the most important thoroughfare, or rather piazza, of the metropolis; and when extended as proposed, of equable width, as far as the Abbey, will open a view of ancient and modern public buildings of great effect, half a mile in length from Trafalgar-square. On the west side, after a range of twelve shops, important buildings continue the line to the corner of Great George-street, where the open church ground reveals the views of the Houses of Parliament, and Henry VII.'s Chapel, the Abbey, and St. Margaret's Church. First, is the Admiralty, with a frontage of about 300 ft. The façade of this building is not very distinguished in architectural effect, save its open dwarf colonnade, inclosing a court-yard, and a portico with lofty columns to its retired front of red brick; these ornamental features but ill accord with the rest of the fabric, which is something akin to Chelsea Hospital, or Hampton Court, a little modernised. The depth towards the park much exceeds the frontage, as there are grounds extending in the rear at least 300 ft. A red-tiled stable and an antiquated house, built on what, possibly, is called the garden, *front the parade-ground*, and are occupied by subordinates of the Admiralty, extending as far as the houses in New-street, Spring-gardens. The main body of the structure is, no doubt, capacious, but this department has much swollen since its first erection, and the lords have been compelled to acquire large detached establishments, and most expensive locations, too, in Pall-mall, Somerset House, Spring-gardens, and elsewhere.

Seeing that all establishments connected with so important a branch of the public service ought to be in propinquity with it, and that so palpable a site lies open at command, it appears strange that instead of renting offices at enormous rates suitable buildings have not been erected on their own ground. A building subsidiary to the Admiralty, if placed there, might correspond with the range of Foreign Offices on the opposite side of the parade-ground; the back windows of the existing building, although screened from a park view, might have sufficient reserves of light and air for ordinary officials; whilst the new structure would afford even better woodland views, and would also stand out to the parade,—thus affording scope for all the ramifications of the Admiralty. Our readers will remember plans for the union of offices on this site which have appeared in these pages.

Next in sequence on the Whitehall east street line comes the Army Pay-office, a stack of the old, quaint, packed description; it is about 100 ft. in frontage, without an obvious portal, but having two entrances, one at the end next the Horse Guards, practicated in the front wall and under the window line; the other through an angle or porch on the Admiralty frontage! The whole structure must be at least 250 years old.

The Horse Guards follows next in street line. This building was commenced in 1751, and was designed by Kent; its aspect from the park is certainly better than the complicated variation, or ornature, as some may call it, displayed on the frontage. It occupies a line of over 300 ft. along the pavement, and as this, too, is inadequate to the service in our times, perhaps the conversion of the Army Pay-office into a subsidiary department for the Horse Guards might be the best mode of redressing a necessity, and at the same time of adding a redeeming feature to the aspect now beheld from the banqueting-hall opposite.

The fine mansion of Lady Dover follows; the front hall, portico, and screen wall, filling up the distance of 140 ft. between the Horse Guards, and the new Privy Council Office, and extending rearward to the park.

In close juxta-position with Dover House, the Council Office completes the line, in a range of 315 ft. to Downing-street. As the interior of this Classic pile is vastly superior to offices of earlier foundation, so in architectureque effect it far surpasses them, as also in solidity, internal adaptation, and finish.

The remainder of the street line from Downing-street to Great George-street will be occupied by the leviathan range of new Government and Foreign Offices, which are, as to the park frontage, now completed, nearly the whole way to Storey's-gate,—viz., to Charles-street. The façade to Parliament-street, which is to be widened to the Council Office line, will add fresh dignity to the continuous piazza.

On the opposing side of Whitehall there is but one public building of any pretension, but that one, the Banqueting House, gives importance to the whole range; and the Duke of Buccleuch's mansion and open court, together with Richmond-terrace, lend to it an unusual dignity.

It may be added, that Hubert de Burgh built the Palace of Whitehall, A.D. 1242, since which it continued to be the most valued site in London. Afterwards, in 1248, it became the urban residence of the Archbishop of York, until in the reign of Henry VIII., that monarch, A.D. 1530, erected a magnificent gallery, decorated by Hans Holbein, for the purpose of viewing tournaments performed in the tilt-yard, which occupied the present site of the Horse Guards and the parade-ground, the whole extent of St. James's Park being then open to view.

In the reign of James I., Inigo Jones was commissioned to design, A.D. 1606, a plan for a new palace, "in place of the old rotten sleight builded Banqueting House." The length was to have been 1,152 ft., and the width 874 ft. The plans were duly matured and drawn, but of the whole design which, if carried out, must have continued to be a lasting monument to the fame of the architect, the Banqueting Hall alone was erected.

There is a great blot on this vicinage,—the state of filth and waste of Scotland-yard, and the whole range between Whitehall-place, Hungerford station, and the Embankment. It has lain for many years in desolation, and must continue so until some decision is come to as to the intended bridge across the Thames, whether the piles and coffer-dams for three piers, which have impeded navigation for so many years, shall be removed, or the works carried out.

THE ARCHITECTURAL PUBLICATION SOCIETY'S DICTIONARY OF ARCHITECTURE.

WE are glad to believe that the completion of the Dictionary is now fairly assured.

A special general meeting of the subscribers was held at the House, in Conduit-street, on the 19th of January; Mr. T. H. Wyatt, in the chair.

Mr. Arthur Cates, the hon. secretary, read a report from the committee, which congratulated the members on the complete discharge of all debts and liabilities, and the possession of a cash balance of upwards of 150l., available for the prosecution of the Dictionary. The result of the exertions made to obtain new subscribers, so as to secure the completion of the Dictionary, was reported as having been attended with remarkable success, only sixty-seven names being now required to fill up the list; and as new adhesions were still coming in, the committee recommended the subscribers to authorise the immediate undertaking of the work of completion, relying on the continued exertions of the members to secure the additional subscribers still required.

The Chairman said he need trouble the meeting with but few observations on this matter. They all felt the great importance of completing this work which, as far as it had yet gone, had done great honour to the profession, though he felt in common with them all, that the great share of labour and responsibility had fallen upon two or three gentlemen. The work having gone to the length it had, it would be a great pity it should now lapse for want of a little individual energy on the part of the general body of the subscribers. Considering that in round numbers 100 new subscribers had been obtained since the annual meeting last May, it would be hard indeed if, in the course of the next twelve months, they did not obtain the additional sixty-seven required to complete the list. He would at once put down his name for an additional copy.

After some conversation, the following resolutions were then unanimously adopted:—

"1st. That the continuation of the Dictionary of Architecture be at once proceeded with in such a manner as to secure its completion at the earliest possible period.

2nd. That the hon. secretary of the Dictionary be requested to superintend, as before, the production of the text.

3rd. That the work as produced be issued,—

A. To all subscribers now on the list, whose subscriptions to December 31st, 1869, shall be fully paid up on March 1st, 1870. All in arrear at that date to be considered as having withdrawn, and will thus lose the advantage of obtaining the completion of the Dictionary of Architecture without further cost.

B. To all subscribers who may have paid up the fifteen guineas in full, for which they will immediately receive all of the Dictionary thus far published.

C. To all new subscribers who, under special arrangement, are paying up gradually the subscriptions for past years, so soon as the payments made by them shall amount to fifteen guineas.

D. To all new subscribers who shall have elected to pay the subscription by instalment, so soon as their payments shall amount to fifteen guineas, they in the meantime receiving parts of the publication already issued, equivalent in value to the amount paid.

4th. That on each part of the publication be marked a price, calculated at rates, based on the cost, at which the preceding parts have been produced, at which price the parts may, at the discretion of the hon. secretary, be issued to persons wishing to complete sets, and to whom the foregoing paragraphs do not apply.

5th. That this meeting pledges itself and the general body of the members, to use every exertion to obtain the subscribers still required, and to aid and support the committee and officers in carrying on the undertaking to a successful issue."

The Chairman said extraordinary energy had been displayed by three or four gentlemen since the annual meeting: as an instance of that he mentioned that Mr. Corson, of Leeds, had recently gained not less than eight new subscribers; and Mr. William Burn had used his influence greatly to the advantage of the society. Accessions to the list had also been made by the exertions of Mr. Abbott, of Sheffield, and Mr. Burnet, of Glasgow, Mr. Horace Jones, Mr. C. F. Hayward, Mr. D. C. Nichols, and many others. A little more energy in the early part of the present year, he was quite certain, would result in the completion of the subscription list to the point fixed upon; and he had no doubt the committee would have the pleasure of announcing before the next annual meeting that the list was complete. He was happy to say that several of the large builders and contractors had recently become subscribers, and in some cases a copy was subscribed for by the individual members of firms.

Several members having expressed the strongest hopes with regard to the speedy completion of the subscription list and the immediate continuation of the publication,

Cordial votes of thanks to the hon. secretary of the society (Mr. Cates), and the hon. secretary of the Dictionary (Mr. Wyatt Papworth), for their past labours and those which they had promised for the future, were passed unanimously.

Mr. Sydney Smirke said he could not allow the opportunity to pass without bearing his personal testimony to the great services rendered by the hon. secretaries. He had seen so much of them in this matter that he could truly say they had been the pillars of the concern, and their labours, intelligence, and constant and indefatigable exertions were beyond all praise, and he thought it was due from all present to thank those gentlemen in the strongest way they could.

A discussion ensued as to the means of expediting the production of the work and the mode of properly recognising the services of the hon. secretaries, and a vote of thanks to the chairman closed the proceedings. Friendly exertions are still required.

THE NEW EAST WINDOW IN CHRIST CHURCH, NEWGATE-STREET.

THERE is no subject upon which it is more difficult to pass a final judgment than upon a stained-glass window. No sure canons of criticism applicable to all styles have yet been fully accepted, by any appeals to which the capricious applause, or equally capricious abuse, of ill-informed taste can be silenced. How far is it allowable, or even expedient, to abandon a conventional for a naturalistic treatment? How far may perfect translucidity be sacrificed for the sake of pictorial effect? At what point does the picture executed in glass degenerate into a mere transparency? What modifications of treatment are rendered necessary when stained glass, whose birth-place was the Gothic cathedral, is transferred to a Renaissance or modern Grecian church? Such are a few of the reflections consequent upon an inspection of the new window placed in the eastern wall of Christ Church. Before, however, saying a word about the window itself, let us applaud the spirit which has led to its erection. We are delighted to hail one more instance of the intelligent interest which the guardians of our City churches now take, not merely in their preservation, but also in their adornment. Churchwardens and vestries vie with, often even urge on, the clergy in the path of improvement. Whatever may be the merits of this church window, let us give credit to the committee under whose auspices the work has been brought to a happy conclusion, to the liberality of the treasurer of St. Bartholomew's and Christ's Hospitals, and

to many of the chief parishioners. Nor must Mr. Hardwick go without a special word of praise for time and thought given to the cartoon.

The subject is appropriate in the church of Christ's Hospital,—Our Lord Blessing the little Children presented to him. The chief figure is seen issuing from beneath a richly ornamented gateway, on the sides of which appear in niches six of the cardinal virtues. On the one side, Faith, Hope, Charity; on the other, Justice, Fortitude, Chastity. In the mouldings of the arch are medallions containing the heads of the four Evangelists. The uncoloured glass (we cannot call it white) of which much of the architectural part of the design is executed is of value in partly redeeming the whole from its obvious fault —a certain sombreness of hue which prevails throughout. The central group is well composed, and, the legitimacy of the pictorial style on glass being admitted, its treatment is deserving of great praise. The figure of our Lord is majestic; the two apostles in attendance on our Lord, the women, and the children, prove that the artist has studied carefully, and profited by his study of, the old masters.

Our criticism would be suspicious if it contained no element of blame; and we do not, therefore, scruple to repeat our regret at the low key, so to say, in which the colouring of this central group is struck. We regret it the more because the window, except to a person standing immediately under it, gets none but reflected light. This aggravates the evil.

In saying so much, we would be understood rather as giving advice which may be profitably followed hereafter, than seeking to detract from the praise due to Messrs. Heaton, Butler, & Baynes for their principal share in the production of this window.

THE DRAINAGE AND WATER SUPPLY OF BUENOS AYRES.

A LAW empowering the Government to carry out a project of Mr. John Coghlan, M. Inst. C.E., F.R.G.S., for the drainage and other improvements of the city of Buenos Ayres, was recently before the legislature of the country, and there was every reason to believe would be passed. The scheme for water supply is nearly completed, although Mr. Coghlan has additional works to carry out. As for the drainage, Mr. Coghlan has gone upon the model of our great city drainage systems; and, indeed, he consulted Mr. Bazalgette and Mr. Bateman on the subject, as well as our own pages, of which he has made good use in his report to the local government.

He proposes a system of irrigation in connexion with the drainage, and points out the land proposed to be used for the utilisation and deodorisation of the sewage before it is allowed to pass into the river. He suggests the introduction of brickmaking and other approved machinery and materials, the erection of lime-kilns, &c., for the execution of the drainage works. The total cost of the drainage works Mr. Coghlan estimates at 598,746*l*. The total cost of the water supply, including the money still required to complete the works, to supply 3,000,000 gallons daily, is 164,000*l*., of which 55,000*l*., constitute the cost of the works already done. Street improvements, 178,571*l*., bring up the total cost to 941,317*l*.

THE EASTER ISLAND STATUES.

EASTER ISLAND, to which we have recently drawn attention,* was the subject of a paper at the Geographical Society on Monday night, read by Mr. J. L. Palmer, R.N., of her Majesty's ship *Topaz*. Mr. Palmer described the topography of this remote island in the South Pacific. As our readers know, it is in a part of the ocean far away from other islands, at a distance of 2,000 miles from the coast of South America, and 1,000 miles from the nearest Polynesian islands to the west. The island is entirely a volcanic formation, and presents numerous extinct craters, one of which yields gray lava, and another the red tufa, from which are carved the crowns or hats that formerly rested on the heads of the figures. The present inhabitants are only 900 in number. They belong to the Polynesian race, and have a tradition of their immigration from Opara at no very distant period. The interest attaching to the island was an ethnological one, and concerned the race who sculptured the vast quantity of stone images now existing *in situ* on stone platforms in various parts of the island, or inside large stone chambers or houses. The platforms, chambers, sculptures, and mural paintings were described by the author, but he did not propound any theory as to their origin. He stated that the inhabitants knew nothing of the matter; that they were undoubtedly of great antiquity; and that it was probable they were executed by a race who had long since passed away.

In the discussion which followed, Mr. Markham mentioned the fact of similar images having been found by the early Spanish invaders in the cities on the banks of Lake Titicaca, in South Peru, and belonging to the Aymara nation. There existed, however, this difference—that the Aymara images were profusely sculptured. Recently a stone platform had been found in one of the Pacific Islands, 1,000 miles to the west of Easter Island, at the bottom of a deep deposit of guano, and he threw out the suggestion that these were all relics of a very ancient people who slowly migrated across the Pacific from west to east. Mr. Franks gave in detail his reasons for concluding that the ancient remains in Easter Island truly belonged to an earlier population of the same Polynesian race who now inhabit the island. Sir George Grey also expressed the same opinion, and spoke of the habit of carving images as being a peculiarity of Polynesians, including the Maories, and that in a place where wood (the usual material) was very scarce, as it is in Easter Island, it was natural that stone should be substituted.

* See p. 10 for illustrations; *et ante*.

PRINTED OR WRITTEN.

Two students write,—Will you kindly inform us whether or not it is correct, in affixing the names by hand to plans in block letters, to speak of them as being *printed?*

*** It is incorrect, though the expression is common enough. If our young correspondents will recollect that the root of "to print," is *premo*—I press, they will see the reason why. To print is to form characters by impression.

ART-UNION OF LONDON.

IN the year 1868, the council of this society offered a premium for a series of partially shaded drawings, illustrating some work of a British author or events in British history.

Thirty-five sets of designs, of various degrees of merit, being sent in, the premium was awarded to a set of twenty, illustrating Canon Kingsley's story of "Hereward, the Wake," and these were found to be the work of Mr. H. C. Selous, an artist well known for his outlines illustrating "Pilgrim's Progress," his historical picture of "The Surrender of Calais," and for works from time to time exhibited on the walls of the Royal Academy.

The designs set forth many of the chivalrous deeds and hairbreadth escapes of the hero. He, "the last of the English," as the author calls him, betook himself to the fen country on our eastern coasts, when the field of Hastings had given England to William of Normandy, and there, with a band of devoted followers—a kind of prototype of Robin Hood and his merrie men—he for a long time set at defiance all the attempts of the king to capture or kill him. At length, after various turns of fortune, partly in desperation, and partly induced by kind messages from William, Hereward determined to go down to Winchester, and become "the king's man." He was received with much kindness and consideration, and lived for some time in great honour at court; but, ultimately, through the envy or jealousy of some of the Norman knights, a plot was formed for his destruction, and he was ruthlessly killed.

All these matters the facile pencil of Mr. Selous has depicted with much spirit and a great deal of fine drawing, though, as usual in such cases, there is not always the same amount of power displayed.

The work has been very faithfully rendered by the burin of Mr. C. G. Lewis, and the twenty plates, bound in a volume, will form the society's presentation work for the current year.

Whoever has read the story will certainly be anxious to secure these plates; and whoever sees the plates will want to read the work; while whoever pays his guinea for a ticket for this year's distribution, will certainly have more than his money's worth, independently of the chance of a picture or other prize. The advertisements announce that the volume will be out on the 1st proximo.

SCHOOL OF ARCHITECTURE.

WHILST the education of the architectural student is under consideration at the present time, it will, perhaps, be a matter of pleasant interest to some of the elder members of the profession to have recalled to them their past efforts in search of academical tuition; and to the students of the present day, the following recital of an attempt to gain that tuition, though unsuccessful at the time, may tend to give encouragement during their own efforts in the same course. It is very satisfactory to see that nearly all those whose names occur in the accompanying list raised themselves to eminence in the profession in London, or in the provincial towns where they subsequently established themselves. Only about ten of the then students are still alive. The originals of the four papers, formerly in the possession of the late Mr. C. H. Smith, are now preserved in the collection of the Royal Institute of British Architects.

WYATT PAPWORTH.

(No. 1.)

"No. 8, Bloomsbury-square,
February 25th, 1817.

Architectural Students' Society.

Resolved:—

1. That this Society have to regret that no public school has been formed in this kingdom for the promotion of architectural students' studies,—a measure highly necessary for the advancement of the art.

2. That the Royal Academy, being the establishment appointed for the promotion of the sister arts, painting, sculpture, and architecture, the Architectural Students' Society regard this institution as the parent of their art, and the most proper place for such a school.

3. That it appears to this Society, as the most probable method of attaining the desirable object, that it would be expedient that the architectural students of the Royal Academy in general should petition the president and members thereof, requesting them to form a school of architecture.

4. That the secretary is desired in the name of the Architectural Students' Society to write to the architectural students of the Royal Academy, enclosing these resolutions, and requesting their attendance (at a general meeting of the architectural students) in order to give their opinion and support to the same.

5. That as correct a list as possible of the architectural students of the Royal Academy be immediately procured, printed, and enclosed in the circular.

6. That the costs of printing, those attending the use of the room, and all other expenses incident to this business, be defrayed out of the funds of this Society.

LIST OF THE ARCHITECTURAL STUDENTS OF THE ROYAL ACADEMY.

Acton, —, Wilson-street, Finsbury-square.
Adams, Joseph, Portsmouth.
Ainger, Alfred, 23, Everett-street, Russell-square.
Aitchison, G., at Mr. Seward's, 30, Craven-street, Strand.
Alderson, James, Chelsea.
Alexander, Daniel, Greenwich.
*Alexander, D., jun., 3, Pier Head, London Dock.
Allason, Thomas, Westbourn Green Cottage.
Angell, Samuel.
Archer, Archibald.
*Bailey, George, 272, High Holborn.
Bailey, James, Paradise-row, Lambeth.
Bassevi, George, Rome.
Baxter, J.
Bedford, F., 8, Southampton-street, Bloomsbury-square.
Busby, Charles.
Brooks, William, 52, Doughty-street.
Clayton, Alfred B., Gray's-inn-square.
Cooper, John, 8, Phillips's Buildings, Somers Town.
*Donaldson, T. L., 8, Bloomsbury-square.
Doull, William, at R. Smirke's, jun. Esq., Albany.
Edwards, Francis, 8, Salisbury-street, Strand.
Kimes, James, Cambden-row, Somers Town.
Foyster, H. S.
Forbes, John, 15, Robert-street, Bedford-square.
Gardiner, J. B., Wormwood-street.
Gandy, P., Newman-street.
Garling, H., Little James-street.
*Goldicutt, John, Rome.
Habershon, —, at Mr. Atkinson's, 50, Bentinck-street, Manchester-square.
Hardwick, P., jun., Berners-street, Oxford-street.
Hakewill, —, 6, Lower Brook-street, Grosvenor-square.
Haycock, Edward.
Inwood, —, 3, Southampton-place, New-road.
Jones, John, Ireland.
Kinnard, W., jun., Rome.
Lane, William.
Leachman, John, 18, Rupert-street.
Lee, Thomas, Barnstaple, Devonshire.
*Lee, T., jun., 43, Devonshire-street, Queen's-square.

Legg, Gorge, 254, Oxford-street.
Lochner, William, 30, Coleman-street.
Malton, Charles, Burton-street.
Martin, Albinus, Gray's-inn-square.
Matson, C., at Mr. Hayes's, 12, Bedford-street, Bedford-square.
Mead, J. Clement, 34, Charlotte-street, Fitzroy-square.
Meikleham, R. S.
Meridith, M.
Maliphant, George, 44, Green-street, Grosvenor-square.
Nicholson, M. A., Titchfield-street.
Osborn, Robert.
Pain, G. R., 1, Diana-place, New-road, Fitzroy-square.
Paterson, Samuel, 4, Holborn-court, Gray's-inn.
Phillips, G., Wandsworth-road, near Vauxhall Turnpike.
Porter, —, at Mr. Chawner's, 82, Guildford-street, Brunswick-square.
Porden, W., jun.
Purser, William, 4, Bennet-street, Blackfriars-road.
Prittchett, Joseph.
*Smith, C. H., 5, Portland-street, New-road.
Smith, Charles, 9, Upper Seymour-street.
Taylor, T., jun., Wier-street, Richmond.
Thomas, M. E., 74, Margaret-street, Cavendish-square.
Turner, John, Shrewsbury.
Tyrrel, Charles, Guildhall-yard.
Upward, J. William.
Vulliamy, Lewis.
Wallace, Robert, 29, Leigh-street, Burton-crescent.
Willement, T., jun.
*Winckworth, John, 35, Upper Norton-street, Fitzroy-square.
Wyatt, Henry.

N.B.—Those who have an asterisk (*) affixed to their names are members of the Architectural Students' Society."

(No. 2.)

"No. 8, Bloomsbury-square, February 28th, 1817.

SIR,—In consequence of the enclosed resolutions, passed at the last meeting of the Architectural Students' Society on the 25th instant, I have to request that you will be pleased to favour the members with your attendance on Friday evening next, the 7th of March, at the Public Room, No. 65, Pall-mall (six doors from the British Gallery towards St. James's-street), in order to give your opinion and support to the same.

Free admission will be given on producing this letter, or your student's ticket, at the door. The doors will be open at half-past seven, business will commence at eight o'clock precisely, and at half-past eight the doors will be closed.

I have the honour to be, sir,
Your most obedient servant,
T. LEE, Secretary.

Note.—In consequence of the impossibility of procuring a correct list of all the Architectural Students of the Royal Academy, it is requested that those who may be written to will have the goodness to communicate the accompanying resolutions to such of their friends as are Architectural Students, and whose names or residences are omitted in this list, and request their attendance at the meeting; they will be admitted on producing their ticket."

(No. 3.)

"To the President and Council of the Royal Academy.

We, the architectural students whose names are hereunto affixed in behalf of ourselves and the other students of the Royal Academy, respectfully beg leave to solicit the attention of the president and council to this our petition, and humbly request that they will be pleased to take its prayer into their serious consideration.

Since the first establishment of the Royal Academy, instituted under the auspices of our most gracious Sovereign, for the promotion of painting, sculpture, and architecture, various schools have been formed for the improvement of the students in the several branches of the two former arts, from which they have received great and manifold advantages. We beg leave most gratefully to acknowledge the benefits which we also have derived from this institution, but we hope and trust the president and council will be pleased to extend to us in our art, advantages equal to those which the students of painting and sculpture in theirs at present enjoy; and, conceiving that it would not only tend to the advancement of the art, but would add to the reputation of the Royal Academy, we venture to petition the president and council that they would be pleased to form for their students a school of architecture, and allow them a further extension of the use of the library.

We presume not to offer any suggestions on the requisites for such a school, but leave it to the liberality and discernment of the president and council to render the object desired worthy the institution, and suitable to the dignity and importance of the art.

We trust that the president and council will be pleased to regard this expression of our wishes as joined with sentiments of the utmost deference and respect. Signed by ——"

(No. 4.)

"8, Bloomsbury-square, December 1, 1817.

SIR,—The members appointed by the Committee of Architectural Students to wait on Mr. Howard with the petition to the Royal Academy, have received the following answer of the President and Council, which I am directed by the Committee to communicate to you.

I am, sir,
Your obedient servant,
C. H. SMITH, Secretary.

'Royal Academy, July 19, 1817.

Gentlemen,—The petition of the Architectural Students in the Royal Academy has been laid before the President and Council; and I am desired to acquaint you that the President and Council, viewing it as a proof of the ardour which the Architectural Students feel in the pursuit of their art, have received it in good part, and will give it such attention as the general circumstances of the establishment will allow.

I am, gentlemen,
Your obedient humble servant,
(Signed) HENRY HOWARD, R.A., Secretary.
To Mr. George Bailey,
Mr. Thomas Lee."

ARCHITECTURAL EDUCATION AND THE DIPLOMA QUESTION.

NORTHERN ARCHITECTURAL ASSOCIATION.

THE president for the year of this association, Mr. T. Oliver, delivered his opening address at the last meeting. We print the concluding portion of it which relates to the subjects at the head of this notice:—

I am well aware of the difficulties, and even the disadvantages, that attend the establishment of an architectural diploma; but these, as in the case of both the legal and the medical professions, may readily be overcome, or even turned, as in the instances referred to, to the well-being of the profession.

This is not a new subject to me, and, therefore, I am prepared with the outline of a scheme for the occasion; and I base this scheme on the mode of procedure that was adopted in the enrolment of the legal and medical professions by the then governments of the country, and which occurred in this wise. About fifty years ago, the legal profession was in a somewhat similar position to our own, with this exception, that while any one could practise, it was necessary to be admitted on what was termed the "roll,"—a merely local matter, and quite a matter of form,—a sort of manuscript directory, indeed. On the application of the examination test, however, a serious question arose; and that was, What is to be done with the present practitioners? That question was soon settled on this principle,—all members of the profession whose names were upon the roll were admitted as attorneys, while all those seeking for admission had to undergo the examination.

In the case of the medical profession the same principle was applied as had been found to operate so successfully, only a few years previously, in regard to the legal profession.

In the year 1815 all persons in practice at that time became legalised practitioners, and could receive a diploma by merely applying for it; all subsequent practitioners to that time, however, were required to pass an examination at the Apothecaries' Hall, and latterly elsewhere at our medical colleges, universities, &c.

Now, my scheme for an architectural diploma is this:—Let the Royal Institute of British Architects obtain an enlargement of its charter, giving it power to bestow a diploma on all architects who are in actual practice,—as architects only,—not to architects and builders, not to architects and engineers, but to architects who practise architecture only,—say in the year 1870,—while all future applicants would be required to undergo an examination, graduated year by year,—say for three years, not longer,—the test-standard being advanced each year, until a thoroughly scientific curriculum was obtained. The details of this scheme could be filled up as the details of those were which I have already mentioned, and which have been altered, enlarged, and improved from time to time as necessity and occasion appeared to require.

The only sound argument that I have heard urged against such a course is that it might prevent those who are qualified by undoubted genius for the profession, but who, owing to neglect in their education, were incapable of passing the ordeal of such an examination as would be required of them. And such a case is instanced of Kemp, the architect of that beautiful and remarkable monument of Scott, which is to Edinburgh what the Arc de Triomphe is to Paris. Such instances, however, are so rare that we are not called upon to legislate for them; and, besides, I question if the man who could produce such an immortal design could not easily work himself up through an examination; for genius is power of mind, and he who can devise great ideas himself can readily appreciate and learn the ideas of others. But admitting that he were not qualified, as in the case in point, he would have to secure the help of others in the event of any great success, as was actually done in this instance; for, if I mistake not, Professor Cockerell and other London architects were called in as consulting architects, and who not only greatly modified the construction of this structure, but also improved it in some esthetic respects. But just as bone-setters, hydropaths, quasi doctors, and others of the present day,—many of them doubtless men of decided talent,—evade the law in the public benefit, so could our genius do, and, under such circumstances, we should all be glad to see it done.

The advantages that would follow a diploma far outweigh the disadvantages, whether real or imaginary. A scientific and technical education would be the result; confidence would be increased, both in the practitioner and in the public; the public would have a control over "sharp" practitioners and empirics; the expulsion of the incapable and the unworthy would naturally follow; and last, though not least, the works of the architect, being designed and directed by educated thinking beings, would become works of art to "all ages and generations of men."

If we put our shoulders to the wheel, we may carry the diploma as rapidly as the events of the day are being carried on around us, whether we look at the Church or the State, or to our social reforms. This, probably, like many events of the present day, will be accomplished by a *coup d'état*.

The acquirement of a diploma necessarily implies a compulsory examination; an examination implies a certain amount of information; and a system of architectural education which will readily supply this information has yet to be established. And this can only be secured by the combined action of this Association with other similar bodies throughout the kingdom. Indeed, this is one of the great movements of the day; and for some years now this society, along with others, has been giving its attention to it.

Education is unquestionably a personal matter. matter. Every separate individual must acquire it for himself. There is no royal road to learning.

But the education I refer to must not only be general, but it must be technical. And here do not let us confound ourselves with terms. We are too apt to have floating ideas of the meaning of terms, and it is only when a forcible thinker or an eloquent speaker puts these ideas in plain language and logical form that we fully realise them; like many indistinct things, which, as by the light of a sunbeam, force themselves upon us when placed in plain and naked outline, and we wonder that we had never seen, though we had often *felt* them before.

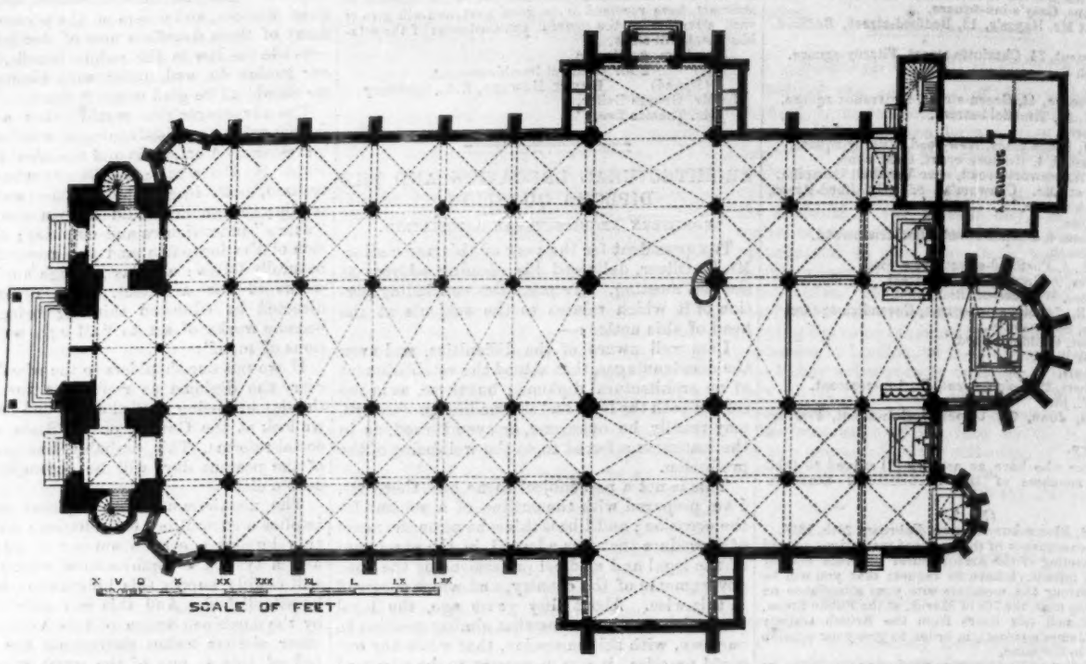
Now what do we mean by a technical education? The term "technical," Webster says, is that which is not in common or popular use. What, then, do we require that is not in common or popular use? What should an accomplished architect know?

Before referring to those subjects required to be known by an architect, and not in common or popular use, I must refer you to those that are. Writing is one, but how rarely it is good; spelling is another, and how seldom this is correctly given; and arithmetic is another. The English language, with a knowledge of Latin and Greek, and perhaps French and German, are the educational accomplishments now in common or popular use.

After the architectural student has acquired a good knowledge of English, he ought to apply himself to the study of language to this extent. Take the dead languages. He ought to have such a knowledge of Greek and Latin as would enable him to divine the meaning on architectural or archæological subjects, by the structure, origin, or derivation of the term. So much of our own language, and so many of the technical terms now in use, are derived from these sources, that it behoves the student to become tolerably conversant with them. Take the living languages. French and German are now the most in vogue, and for this, as well as for the additional reason that very valuable works in these languages have recently been published, he ought to become sufficiently acquainted with them to enable him, at the least, to read with fluency; and as travelling has so much to do in forming the taste and judgment, he ought to be able to make known his wants and wishes through these media.

Now for the technical. Premising that the architectural student necessarily becomes an accomplished geometrical draughtsman, and acquires an intelligent knowledge of the etiquette and routine of professional practice in the office of his principal, his special educational curriculum must embrace,—

First.—Drawing, in its more advanced forms, such as freehand, for the filling in of foliage



ST. BARBARA'S CHURCH, BREDA.
Plan.

and ornamentation; model or figure, for the arrangement and grouping of statuary and sculpture; perspective, for easy illustration of his daily duties; and "hand-sketch" drawing, for the sketching of buildings, mouldings, what are called "bits," and for help in rapid designing. Indeed, he ought not to rest satisfied until he can sketch a building so accurately as that the respective proportions shall be relatively the same as if laid down geometrically to a scale.

Second.—History: the history of architecture; of all architecture; of art generally, embracing the schools of painting, sculpture, and perhaps music, with the history of his own country in particular.

Third.—Mathematics, embracing a knowledge of algebra, geometry, mensuration, and general arithmetic. Practically, an expertness in calculating areas and cubes, squaring dimensions by duodecimals, and a capacity of applying algebraic or arithmetical formulæ, are about as much as the architect will care for carrying about with him, unless his forte lies in this direction. The mathematical and the artistic are so inimical, the one being the practical application of a rule, the other the inspiration of free, original thought, that I should not lay much stress on great proficiency here. An artist friend of mine never could add up pounds, shillings, and pence, but he had a remarkable eye for gorgeous colour. I do not by any means wish to undervalue this study. It is an essential portion of study, and like logic, if it teaches you nothing, it disciplines the mind.

Fourth.—Design. The architect must be able to express his thoughts in drawing, just as the author expresses his thoughts in writing. They are but different modes of communicating to others what we ourselves feel. No one can design until he understands certain esthetic laws; these laws, I confess, I am at a loss to express, they are so subtile. But they are seen in all works of art, are felt to be in nature, and are spontaneous and intuitive in the breast of the artist. This power, together with a knowledge based upon observation and experience, as well as that of book-learning and memory, will enable a man to design. A knowledge of the details of each style is, of course, essential to success; and the feeling above referred to is greatly enhanced by the study of executed works, in this and other countries, by travelling, and by discussion and reading.

Fifth.—Construction. A sound knowledge of construction is of the utmost value to the architect. Here, his mathematical attainments are called into operation; but as mathematical formulæ and constructional data are based upon experiments or observations amounting almost to facts, an experimental comprehension is of far more value, in the multifarious instances of ordinary practice, than a mere collection of formulæ, valuable as these unquestionably are. Now, to my mind, construction is best taught by lectures, and it is best taught by illustrations of failure. No man can correctly tell by abstract calculation what the thickness of a tower foundation wall should be, with given height and span, unless he is previously acquainted with the ordinary rules as applied in practical operations.

Sixth.—I must now group the remainder of the technical subjects required to be known by an architect, not in common or popular use, with just a word or two upon them. He must be acquainted with chemistry as applied to ventilation, sanitary matters, and certain classes of building materials; with geology, as applied to stone, clay, foundations, and also to certain classes of building materials; with acoustics, as applied to the relative sizes of lecturing and concert halls, churches, chapels, and other public structures; with mechanics, hydraulics, surveying, and levelling; with the principles on which valuations are founded; a knowledge of building materials in their application to specifications; and lastly, he ought to be able to take out the quantities of one of his own designs, for the sake of the essential good that the practice in doing so would do him for his lifetime.

Such are the technical studies to which an architect must devote himself under ordinary circumstances. But if he should have a forte for any particular branch of study, to this forte let him by all means direct his attention.

ST. BARBARA'S CHURCH, BREDA, HOLLAND.

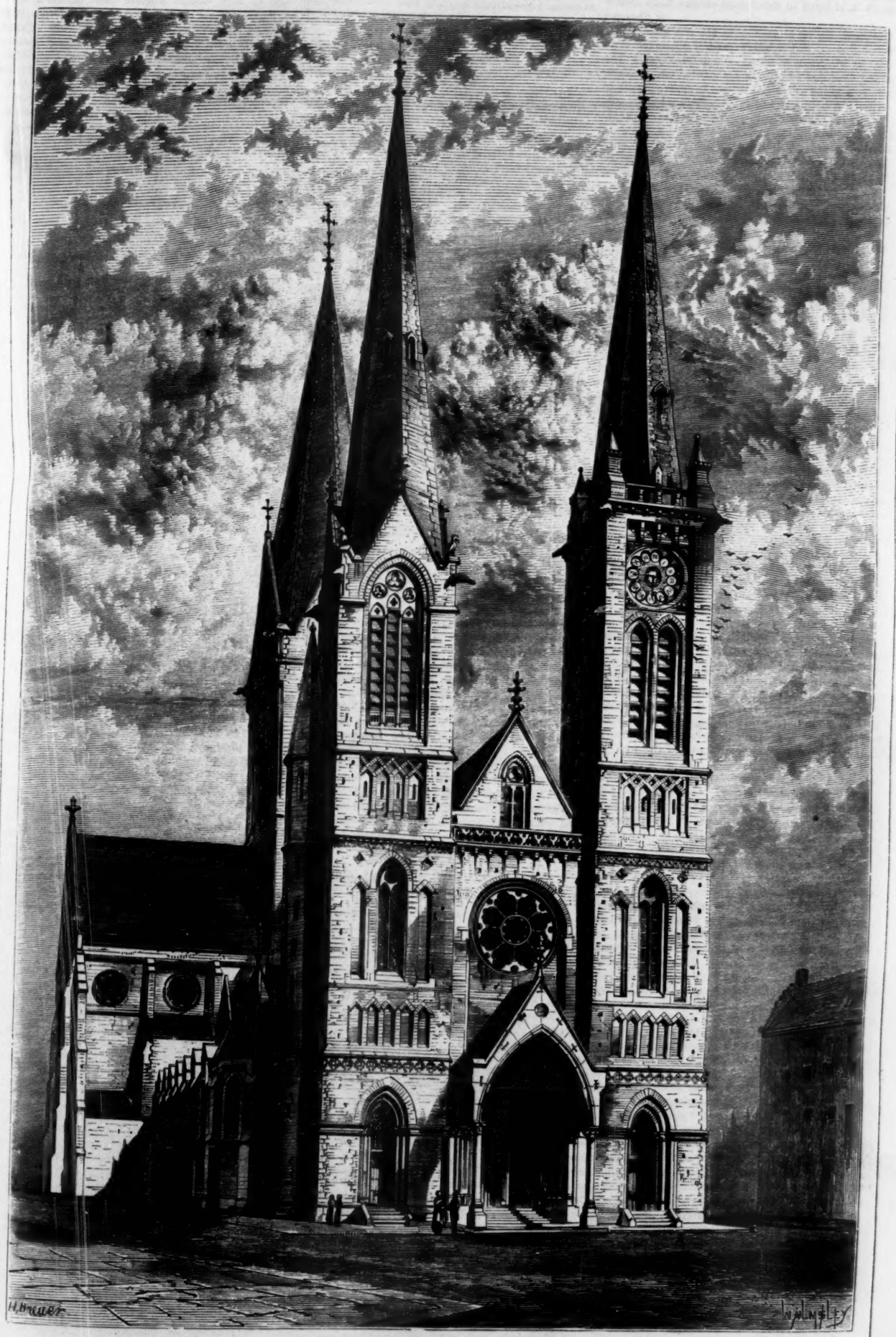
THE new church of St. Barbara, in Breda, the opening of which we noticed in the *Builder*, vol. xxvii., p. 691, is one of the most remarkable examples of the revival of ecclesiastical architecture in Holland. The style chosen by the architect, Mr. Cuypers, is First Pointed, of that plain and rather severe kind so common in Belgium and parts of Holland. The plan of the church consists of a western porch; two western towers, flanking the nave; a nave of six bays, with four aisles; transepts, each three bays deep; a choir of three bays, also with double aisles; and a sanctuary of two narrow bays, terminating in a five-sided apse. The east bay of each of the four choir aisles forms a chapel, and has its separate altar. The high altar stands upon the "chord" of the great apse. The choir is fitted up with stalls and a rood-screen. There will eventually be three spires, two at the west end and one over the crossing of the nave and transepts; at present, however, the western towers are only carried up to a level with the apex of the roof of the nave.

The interior of the church is very striking, the whole building being vaulted, and the number of columns and arches seen at once give picturesque perspective effects.

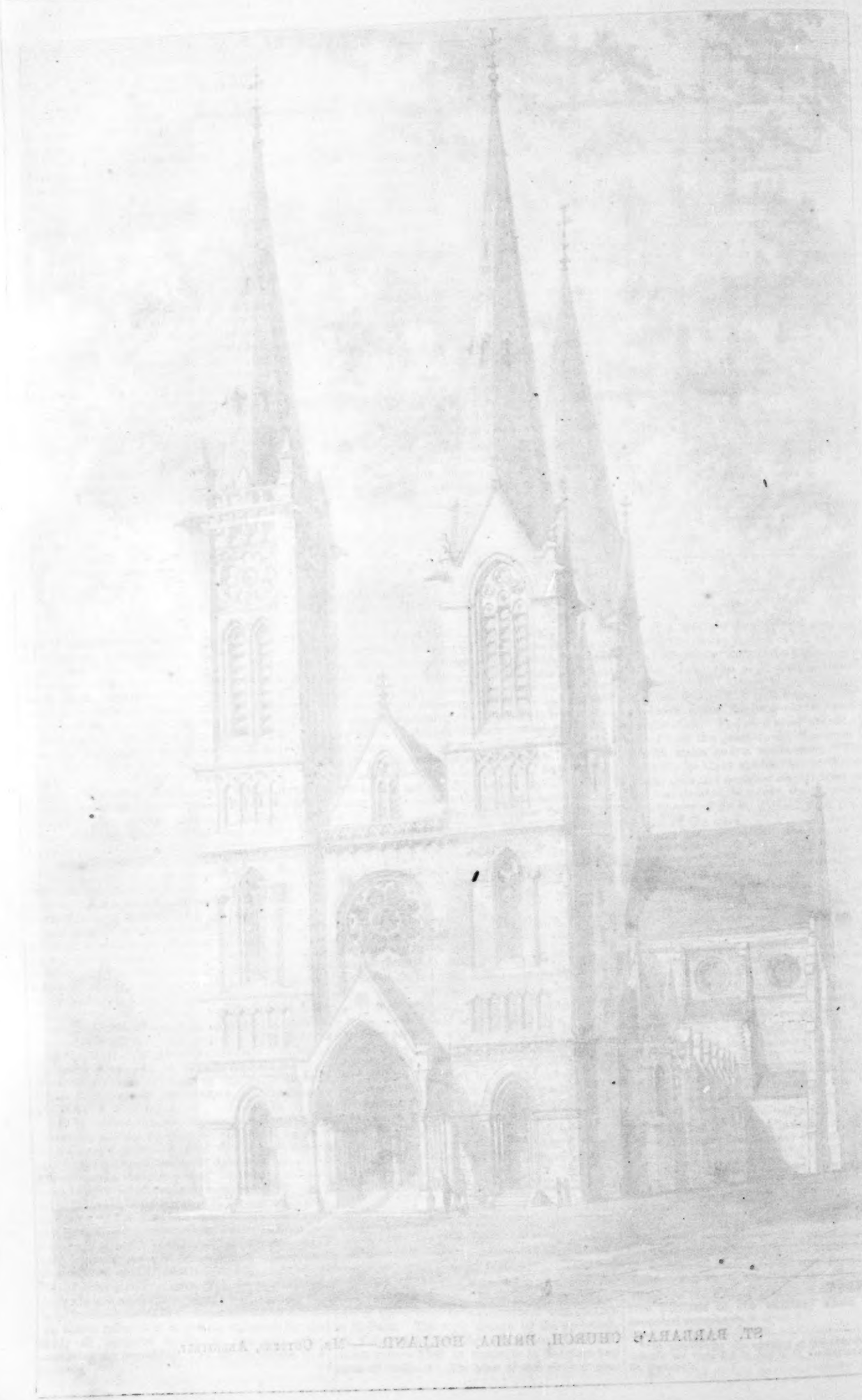
A very remarkable feature in the interior of this church is the large triforium, equal in height to the arcade of the nave. This triforium is used as a gallery, and extends over the two inner aisles of the nave and chancel. Above this triforium is a clearstory, lighted with rose windows. It seems to us that this clearstory is scarcely important enough for such a large church; however, we must, in justice to the architect, allow that he could point to many ancient examples of churches in the north of Germany, where the clearstory is treated in the same way.

The whole church is built of brick, with the exception of the window-tracery, the columns, strings, &c., which are carved out of a stone called *Savonnière*. The steps and lintels of the doorways are of Belgian granite. The vaulting is filled in with brick called *Vefelsteen*; the ribs are of stone. The cost of the shell of the building, exclusive of foundations, towers, and all carving or decorative work, was rather less than 15,000*l.* in English money. Of course, it must be remembered that materials and time are cheaper in Holland than in England. All the carving, the capitals, sculpture, &c., were executed in the workshops attached to the architect's offices at Roermond, and carried out from his own designs and under his direction. The same may be said of the stained glass and all other decorative portions of the building which could be executed separately.*

* In mentioning the opening of this church in our last volume we were led to call it St. Catherine's instead of St. Barbara's.



ST. BARBARA'S CHURCH, BREDA, HOLLAND.——MR. CUYPERS, ARCHITECT.



ST. BARBARA'S CHURCH, HALL, HOLLAND.—Mr. CHAS. ALLOM.

VALUE OF GROUND RENTS IN LONDON.

ON Tuesday last Messrs. Foster sold, at the Mart, freehold ground rents (for terms of eighty years), with reversion to rack rents, created by the Metropolitan Board of Works in New Southwark-street. They amounted to 2,505*l.*, and produced in twenty-seven lots 68,080*l.*, at prices varying from 26 to 33 years' purchase, or an average of nearly 27¼ years. We give the details of some of the lots:—

	Ground-rent.			
1 House, shop, and appurtenances, a few doors from Bear-lane, in the occupation of Mr. Baker	£30	0	...	£780
2 Mercantile premises, on the south side of the street, near Gravel-lane	105	0	...	2,750
3 Ditto, adjoining eastward the preceding	66	10	...	1,730
6 Mercantile premises, in the occupation of Messrs. Waite & Co.	162	0	...	4,540
7 Mercantile premises, adjoining the preceding, in the occupation of Messrs. Daniel Judson & Son	63	0	...	1,800
11 Mercantile Premises, on the north side of the street, the corner of Essex-street	50	0	...	1,360
12 Mercantile premises, adjoining the preceding	89	0	...	2,430
13 Premises, adjoining the preceding, in the occupation of Messrs. Peter Lawson & Sons	108	0	...	3,520
15 Mercantile premises, on the south side of the street, the corner of Southwark-square, in the occupation of Messrs. Joseph Hunt & Sons	90	0	...	2,460
16 Mercantile premises, adjoining the preceding, part in the occupation of Messrs. Isaac Beer & Co.	75	0	...	2,060
17 Ditto, on the eastern corner of Worcester-street	52	0	...	1,450
18 Mercantile premises, on the north side of the street, in the occupation of Mr. W. V. Wright	110	0	...	3,070
20 Ditto, in the occupation of Messrs. Dalton & Morgan	140	0	...	3,090
22 Mercantile premises on the north side of the street, adjoining eastward the entrance to the testing-office of the Metropolitan Board of Works	75	0	...	2,030
23 Mercantile premises, adjoining eastward the preceding, in the occupation of Messrs. Price, Dunn, & Co.	85	0	...	2,400
26 Mercantile premises, Nos. 14 and 15, on the south side of the street, in the occupation of Messrs. Pattenden, Smith, and others, hop factors	165	0	...	4,290
27 Premises of the Alliance Bank, the corner of Southwark-street	500	0	...	12,850

MOTES OF MISCHIEF.

OLD readers of the *Builder* will not find anything very new in the leading idea of Professor Tyndall's important lecture on "Dust and Disease," at the Royal Institution, which has justly received much praise and attention. Take one passage written years ago:—

"How can the atmosphere—invisible, tasteless—convey these impurities? it has been asked. In the ordinary light which exists between the brightest sunshine and darkness, the atmosphere seems, so far as appearance goes, pure and harmless. When the sun shines, however, through narrow channels, into this seeming void, the motes in the sunbeam show that the atmosphere is anything but transparent: countless myriads of minute atoms of matter are constantly floating in the atmosphere, and entering the lungs of young and old. Here, then, is palpable evidence of the necessity for care. The semi-opaque nature of the air we breathe is evident; and far smaller particles, which the eye cannot see, are constantly rising from the surface and floating around,—germs of disease, emissaries of death.

In ill-paved streets and back yards in a similar condition, on which waste water is allowed to remain and saturate the soil, when the drainage from cesspools also further pollutes the earth, exhalations fill the air, and poison the system of those who are unfortunately obliged to inhale this important necessary of life so adulterated. Those who, in the cleanest and best-ventilated houses in the metropolis, have noticed the thick layer of dust that in one day covers tables, books, and the surface of every other object, can form an idea of the large quantity of these floating atoms which enters the mouth, both during day and night, at every respiration.

If the dust on the walls and floor of a room in which tobacco has been smoked be swept up, and then carefully packed away, on examination, after some time, it will be found that the tobacco-fumes are still detectable. Window hangings, carpets, and other fabrics will absorb the gases thrown off by tobacco, sulphur, and similar matter. In the same way the bad gases arising from overcrowded sleeping-rooms, or from drains, pervade and lodge themselves to a considerable extent on all surrounding objects, and poison those motes made evident to us by the sunbeam; and which, even when the bright sunlight does not make them visible, are still surely performing the never-ceasing work. Although in ships at sea, on mountain-tops, on moors and marshes, the motes, showing the never-ceasing operations of nature, glisten in the sunshine, there is a difference between the wholesomeness of such dust and that which arises in the houses of polluted courts, in the neighbourhood of crowded graveyards, in ill-ventilated assembly-rooms, overcrowded barracks, and other places. The particles of dust loaded with fever and contagion are readily borne upon the breeze from ill-conditioned and hidden places to those adjoining, and, of course, to a certain extent adulterate the better atmosphere. As an instance of the extent to which scents can be borne, it may be mentioned that when the wind has been blowing gently in the right direction, we have often distinctly identified, in Holborn and in parts of the City, the pleasant smell of the new hay from the meadows on the north of London. In like manner dangerous nuisances are floated on the air; and this circumstance, together with the sight of the motes in the sunbeam, ought to be a lesson to us that large masses of the poor cannot be neglected with impunity, and should teach us that it is necessary to preserve the atmosphere from pollution."*

GOSSIP FROM ROME.

A FRIEND writes from Rome:—

"Two days ago I went out to S. Paolo 'fuori le mura,' to see it in the midst of a lake about half a mile round the church. Of course it was not possible to get to the church, as the water was nearly 3 ft. deep. I do not yet know if the water got inside on to the beautiful pavement. My good patron, Cardinal Weld, made a successful effort to raise the floor 3 ft., so I shall be curious to know the result. Inundations are now damaging all Italy; Pisa and Florence are great sufferers.

The great Exhibition is preparing in the vast corridor of the cloisters of the Baths of Diocletian, Sta. Maria degli Angeli, where the cypresses stand. It is finely getting up;—an immense circular saloon, with compartments to the centre, where a 'piazzetta' is formed round the trees. This saloon must be of immense diameter, and is skylighted all round. As the Exhibition is to be ecclesiastical in all its objects, I cannot conceive how its vastness will be filled. The mile of corridor is for sculpture: works from the '*cinque cento*' to our time are to form the show. Vespignano is the architect; but the constant rain has almost suspended the work. Certainly everything this Pope does is splendid. The stained glass windows in S. Paolo are now complete, and are magnificent works of art, giving dignity to the building.

ST. LUKE'S WORKHOUSE.

THE Guardians of the Holborn Union have received the sanction of the Poor Law Board to their proposal for adapting the St. Luke's Workhouse to the purposes of a hospital and infirmary for the sick poor of the Union, and to the alteration of the workhouse in Gray's-inn-lane for the reception of able-bodied paupers. It is intended at once to erect a large block of building to contain 450 aged and infirm women at St. Luke's Workhouse, according to the plans prepared by the architect to the Union, Mr. Saxon Snell, and which plans have received the unqualified approval of the Poor Law Board.

The proposed buildings at St. Luke's are estimated by the architect to cost 14,000*l.*, inclusive of architect's commission, fittings and fixtures, and all other charges of every description. This estimate is at the rate of 27*l.* per bed for the hospital portion of the building, and an additional 2,000*l.*, if a basement story be added, as designed.

SIZE OF MORTAR JOINTS IN BRICKWORK.

SIR,—This subject may be considered in a variety of ways. First, if we consider that the strength and capability of sustaining weight will be increased by having thicker mortar joints than those commonly made, then it would appear probable that a building erected with mortar walls and without any bricks, would be of still greater strength; but we know that the mortar usually used would stand no such test. It therefore seems probable that thin joints would be preferable. But it may now occur to us,—then, why have joints of any thickness; or why should they be of a certain thickness, and neither less nor more? This will lead us to consider the properties of mortar and the duties it actually performs in brickwork, and to endeavour to discover how we can cause it to most effectually perform those duties.

Respecting its properties, it would be unsafe to consider that mortar is generally capable of bearing the compressile power that brick will bear, therefore the less of it we can manage with the better; but as thin, flattish pebbles will pass through a fine sieve, and may chance to lodge on edge when in a mortar joint, such would in too thin a joint cause the brick above it to ride, and the extra thinness of such joint would consequently be an element of instability instead of strength.

The duties mortar has to perform may be considered principally as two, viz., first, to be the means by which each successive course of bricks may be solidly bedded; secondly, to be the agent which shall enable each brick to bond with those beneath it.

We have already seen that it would generally be inadvisable to have thick joints, on account of any imaginary compressile superiority of the mortar over brick; we shall now see that joints as thin as they can with safety be made will also generally be desirable, when considered in their action, as the means by which "bond" is effected, for bond is the tying, as it were, of bricks by one or more bricks laid across and uniting them, and which is effected by means of the mortar placed between them, which, filling the inequalities of the bricks so placed, will, with a sufficient weight on the upper course, be the means of preventing the bricks in the under course from being dragged apart.

Then to consider whether thick or thin joints will more effectually achieve the bonding, let us consider the action of two stretchers bonding (in English bond) three "headers." If the joint in such case be made thin,—say ¼ in. thick,—then as the stretchers would bear 2¼ in. on each of the two outer "headers," and the bonding connexion between them would be the mortar under each end of the "stretchers," and in each case being in sectional area (taken parallel to the face of the wall) equal 2¼ in. by ¼ in.; then such would in the tearing asunder of the two outer "headers" be subjected to a compressile strain acting in a direction (nearly or quite) identical with a diagonal to the said area. Now, if we were to increase the thickness of our joint, then the length of the diagonal would also increase, and would consequently be unlikely to resist so great a strain as the shorter one, for the same reason that a long column will generally bear less pressure than a short one of equal diameter; also the angle of inclination of the shorter diagonal, being less than that of the longer, would give it an advantage over the latter.

But let us yet consider it in another way: if a ½-in. joint be stronger than a ¼-in. ditto, then why not a 1-in. also stronger than a ½-in., and a 2-in. than a 1-in., a 4-in. than a 2 in., an 8 in. than a 4-in., and so on? Let us consider an 8-in. joint, then our old sectional area of 2¼ in. by ¼ in. will become 8 in. by 2¼ in., the 8 in. being its height, and consequently the mortar connecting the ends of the "stretchers" with the "headers" will be easily cracked; and the "bond," in this case, show itself to be no bond in reality, as the strain would here be a tensile one, and which mortar would be unlikely to bear.

And again, if thick mortar joints be the element of strength, why should voussoirs, or arch-bricks, be cut or rubbed for the sake of strength? or, better still, why not have, as before, joints of, say 8 in. in thickness, or to gain the utmost strength arches of mortar altogether, no bricks being used?

HENRY AMBROSE.

THE clause enforcing thin mortar joints seems to me a relic of those classical days when every brick was required to be gauged to the same size, and all the joints tuck-pointed; and that when the architectural mind became emancipated, the battle of the styles was so hotly contested, that small matters of detail were overlooked, and in the routine of the office the clause has remained unchanged and unchallenged. With regard to the thickness of the joint, I am of opinion (without going into the chemical properties of mortar), that the thick joint is preferable if the mortar is good: the bricks generally used being of an absorbent nature, suck in a certain amount of moisture from the mortar, which moisture is necessary for its proper crystallisation: the thinner the joint the less resistance it can offer to the suction of the brick, and the less quantity of moisture it can afford to lose. The thick joint retains its moisture until the crystallisation takes place: it makes a greater allowance for the inequalities of the brick, and makes a much better bed in every respect. Another tradition of *olden times*, is the practice of rubbed and gauged arches: the arch, instead appearing as strong as, and part of, the surrounding work, has quite a cheesy effect, owing to the outer face and protecting coat being rubbed off. If our Gothic architects would try the effect of arches merely axed and set in cement, the character of many buildings would be much improved.

C. N. McI. N.

I VENTURE to say that where the joints of a piece of brickwork are of an equal thickness of a ¼ in. throughout, the settling of the work is

* "Town Swamps and Social Bridges." By George Godwin. 1858. In *Builder, ante.*

equal, and the joints being small, they do not bulge enough to do any harm. Whereas in a piece of brickwork where there are large joints, the settling of the work is unequal, and in consequence of the quantity of mortar, it causes the joints to yield to the weight above, which makes the joints bulge outwards: so that whenever it rains, the joints catch every drop that may trickle down the wall, which, in my opinion, causes a great deal of dampness in the walls.

A BRICKLAYER.

THE FATAL PANIC AT LIVERPOOL.

A TERRIBLE catastrophe has occurred in the Roman Catholic Chapel of St. Joseph, Grosvenor-street, Scotland-road, Liverpool, resulting in the death of sixteen persons, and injury to others. While a drunken man was causing confusion in the crowded chapel by vociferations about not stopping there any longer, some person unknown, whether by way of practical joke or otherwise, bawled out "fire," and a complete panic seized the congregation. A rush was made to doors and windows. It appears that there were large doors opening outwards, with printed directions to push them open prominently posted on them; but to these the panic utterly blinded the people; and one crowd from the chapel met another from a school in the same premises, where another congregation had been alarmed by the same idiotical cry of fire, the result being that many were thrown down, trampled on, and suffocated.

HERNE CHURCH, KENT.

ON Tuesday, the 18th, the chancel of the parish church of St. Martin, at Herne, was re-opened after a rearrangement of the seats and fittings. Previously to the alterations, the chancel steps were very steep and awkward, and the floor had been brought to within 7¼ in. and 8¼ in. of the seats of the sedilia, although these had been raised about 4 in.; and though there were six of the old stalls remaining, these had been placed in such a position as to render them useless for their proper purpose of seats for those conducting the services. The floor levels have now been remodelled, rendering the steps of an easier grade, and bringing them into harmony with the sedilia, which have also been restored to their original height; the pavement being laid with Minton's red, black, and buff tiles, to pattern, in place of the old coarse red and black tiles in alternate squares. The old altar-table has been replaced by a new one of oak, with panels and tracery, and covered with an altar-cloth with embroidered super-frontal. Eight new stalls of oak have been carved similar to the ancient ones, and, with them, placed according to the original arrangement, viz., with three returning on each side at the west end of the chancel; and the old bench ends, with carved poppy-heads, have been reframed with new seats and backs. A new oak screen, with panels filled with tracery, has been placed at the entrance to the chancel. A fine organ (by Lewis) has also been provided. The alterations were carried out under the direction of Mr. Walter F. Dawson, of London, architect; and the wood carving was done by Mr. Adams, of Herne Bay.

KIND WORDS FROM THE LAND'S END.

WE find the following hearty expressions in the *Cornish Telegraph*. As a spontaneous outbreak of kindly feeling, we are tempted to quote it:—

"A firm grasp and vigorous shake of the hand, if they be cordial, are good at all times; but at no season can they be more fit than now, when mind and body, after a too brief season of rest, must be girded up for one more stage of life's journey. Distance, in these days, is no barrier to a prompt and hearty expression of good wishes; for electricity can speed a whisper with the suddenness of lightning, and the pen's utterances are conveyed hundreds of miles in a few hours. Moved thereto by its first article for the year 1870, we send our hearty good wishes to our contemporary, the *Builder*, from whom, for nearly twenty years, we have derived, week after week, something valuable in the way of art instruction or practical hint. For twenty-seven years our friend has laboured in the interest of those who plan and those who construct the edifices of the present day. Seeking to elevate and enlarge the views of the one class, and to advance the social and material position of the other, with intelligence so broad that the world is ransacked for all that may instruct; with heart so large that every kind of art and handicraft has its interests studied; and with eye so microscopic that no event within its sphere transpires, even in this remote corner of England, but the *Builder* sees it, no wonder that our friend is both prosperous and respected. For twenty-five years the present editor has been at work, and he says with perfect truth that if a right estimate of the labours of his coadjutors and himself be required, the volumes they have produced, and not a single number, should be glanced at. In this we fully concur. To take but one branch of editorial labour—the arguments and facts in favour of sanitary progress; the accumulated proofs that disease is dear and health invaluable; that the one may be averted and the other secured, to the heightening of human happiness and the prolongation of human life; and the plain rules laid down to attain greater comfort and more length of days;—and, even here, we find our contemporary's columns a mine well worthy exploration. There is, further, in this article, a passage or two peculiarly grateful to those who have Cornish industries at heart, not because the topic is our own, but by reason of its hopefulness and confidence in the future. We will quote it.

* * * * * *

And, in the hope that the *Builder* may continue to play a useful part in the future, we wish it good speed in the year 1870."

THE INDIAN GOVERNMENT AND THE CIVIL ENGINEERS.

IN the reply received by the Institution of Civil Engineers, Col. Strachey says for the Government of India,—

"It has been a subject of much regret to the Governor-General in Council, that serious misunderstanding of the intention of this notification should have arisen among civil engineers, both in this country and in England. His Excellency in Council, when informed that misconceptions had occurred, lost no time in issuing a circular order to explain the object and origin of the notification, and to assure the civil engineers in the service of the Government in India, that nothing had been further from the intention of the Governor-General in Council than to impute unworthy practices to the profession. A copy of this circular is annexed.

His Excellency in Council most fully accepts the declaration made by the Council of the Institution of Civil Engineers of the principles which are recognised by the profession in relation to the payments they receive for their services, and he desires to add that there has never been any doubt on the part of the Government of India on this subject, and that the notification specifically and exclusively referred to the receipt of commission which was a *legitimate* source of emolument, as being a recognised practice."

The Government made a very blameable mis-statement, to which we early drew public attention, and have got out of it in the best way they could.

MIDLAND COUNTIES MIDDLE CLASS IDIOT ASYLUM.

SIR,—Kindly allow me space to say, in reference to this competition, that Mr. A. Waterhouse is now engaged in examining the designs, having been nominated consulting architect, by a large majority of the competitors.

The plans will be exhibited in the Athenæum Hall, Birmingham, on Monday, January 31st, and the five following days. Cards to view may be had from me.

W. G. BLATCH, Secretary.

A NOTE FROM TORONTO.

SIR,—I have been a constant reader of the *Builder* for many years, the numbers of which have so accumulated as to form almost a library of themselves. I am an old worn-out architect, and have retired to a snug retreat on the north shore of Lake Ontario, and look as regularly for my *Builder* every week as my Sunday's dinner.

The number for November 6th, 1869, was particularly gratifying to me, as it referred to Leeds Castle, in Kent. In 1822 I left London on a tour through Kent in search of employment, having a letter of introduction to a well-known barrister of the name of Scudamore, residing at Maidstone. He kindly recommended me to the gentleman in charge of the works at Leeds Castle, who employed me as timekeeper. I remained there but a few months, as I was a good deal annoyed by being always spoken of as the little Cockney.

I emigrated to Canada ten years afterwards, and was fortunate enough to gain the good opinion of the then Governor, Sir John Colborne, and most of the leading men in York (now Toronto). In 1833 I erected a villa for the Hon. C. Widmer, M.D., whose wife was related to the Martins of Leeds Castle. They were the only persons that I ever met who knew anything of that castle.

I was present with the four men when, on removing the last piece of the oak floor of the Queen's Wardrobe (described in the *Builder*); the chestnut oak girders, which crossed in the centre of the room, were so rotten that they broke with the weight of the men who were at work upon them. No bones were broken, but the men received frightful wounds on their legs by falling upon the points of the splintered oak flooring which stood upon end in the room below. I escaped by jumping into the recess of a window. I was also present at the erection of the temporary bridge across the moat for the conveyance of the *débris* of that part of the castle which was pulled down. I was also present when the moat was dragged, and a large pike caught, 4 ft. 11 in. long, weighing 28 lb. I had struck it with a hand-saw a day or two before, and when caught the mark was clearly visible.

I have requested my stationer to procure for me Mr. Martin's "History of the Castle."

As to "Bells of St. Mary's, Cambridge," page 909, of the 4th of December number, Southey tells that in the year 1796 the Cambridge Youths rang a peal of Bob Maximus in five hours and five minutes. It consisted of 6,600 changes.

This reminds me of a tomb in Leeds churchyard, erected to the memory of ten celebrated bell-ringers who rang for, I think, 38 hours without stopping. The whole account was quite legible on the tomb, for I read it forty-seven years ago; so fresh is it in my memory that I know the man who called the Bobs was over seventy years of age.

If one of your correspondents will gratify a garrulous old man by publishing a true account of the Leeds bell-ringers who have slept in Leeds churchyard for, I think, seventy years, most of your readers will be pleased, and none more than JOHN G. HOWARD.

Toronto.

P.S. I send you two views of the Toronto Lunatic Asylum, erected by me for the Government twenty years ago.

TENDERS: KITE'S-NEST FARM ESTATE, HASTINGS.

SIR,—In August last an advertisement appeared in your paper for tenders for the construction of roads, fences, &c., on the above estate, and for which at least five or six competent and responsible contractors from London submitted reasonable estimates, also others in the neighbourhood and from other parts. Tenders having been duly sent in at the appointed time, parties were then informed that the successful person would be written to, and others would see the result in the *Builder*. But such has not been the case, and for nearly five months no result could be known; but, after the lapse of that time, a person has been accepted, he not having submitted any estimate amongst the rest at the time invited for. However, such being the case—setting aside the length of time parties have been kept in suspense in knowing the result;—the expense, which was not a nominal one, to obtain all particulars, visit the place, make estimates, &c.,—I ask, is not this not only great injustice, but scandalous treatment, to put persons to the trouble and expense to respond to an advertisement for a mere nominal competition? Your giving this publicity will greatly oblige a few of the UNSUCCESSFUL.

THE HOLBORN VIADUCT.

WE have received a long letter from Mr. Richard Bell, to whom the chief premium was awarded by the Corporation for his design, in reply to Mr. Haywood's letter in our impression of the 27th of November last. The length of time that has elapsed justifies us in declining to print it.

FOREIGN LOANS—A MISTAKE.

You have done good service in warning the British public against that delusive investment in the sinking funds of *Foreign Loans*. There is an incredible amount in millions that has been lost in Spanish, Mexican, North American, and other State stocks. In one repudiating State, Indiana, the writer lost 1,500*l*. But nothing will warn the fools ever ready to "rush in."

A loan is now in the market for 12,000,000*l*., ostensibly for railways; but how know we but that this may furnish a hostile power with means of attack? At all events, these loans, on the first approach of difficulties, become well-nigh unnegotiable; and there must ever be the greatest amount of risk attending them.

Proper national works, undertaken on a sure basis and with care, should be fostered by our paternal Government, ever engaged in party squabbles.

The landowners will very soon be found coming forward offering land to railway companies if they will simply treble the value of that adjoining by running a line of railway through it. PAULATIM.

BARRACK ARRANGEMENTS.

A PAPER has been read by Dr. Stallard, to the Social Science Association (Mr. R. Rawlinson, C.E., C.B., in the chair), "On the Construction of Barracks in reference to the Physical and Moral Improvement of the Soldier." Dr. Stallard said that he had to lay before them some objections which he had offered to the Government against the principle upon which the most complete barracks are constructed, and to submit suggestions to insure comfort to the soldier, inducing a better class to enlist at less cost than at present. As a rule, commanding officers preferred the establishment of large barrack-rooms, to contain at least twenty-five men; while the soldiers themselves, tired of constant association with a number of their comrades, and, in fact, continual life in public, would like to be more private. Dr. Stallard drew attention to evil effects from the constant association of twenty-five or more men, in the absence of all privacy, and the difficulty of maintaining any high standard of discipline or moral tone among so many. As a rule, he believed it to be the case that one bad man was more likely to bring the whole down to his own degradation than a good man was to raise them to his, and he attributed to the constant and enforced association of the soldiers a great deal of their partiality for the canteen and the public-house. As a remedy for this state of things Dr. Stallard suggested that barracks should be constructed on the same plan as convict prisons, and so provide for each man a separate cell or apartment for his own use at night. Thus, let us here remark, the treatment of our soldiers, like that of our poor, would be more humane and proper if it were brought up to the standard of our treatment of scoundrel convicts. Dr. Stallard found, moreover, that the cost of barracks, as at present constructed, was not less than 60*l*. per man; whereas the cells of prisoners on the corridor plan cost only 18*l*. per man. He was convinced that the men as-

sociated with each other during the day would prefer to be private at night. The separate system would improve their health and morals, and would enable the officers to exercise a more strict supervision over individuals than could be practised under the present general system. In a discussion which took place on the subject of the paper, it was mentioned that partitions had been introduced with good effect in the sleeping apartments of public schools. The partitions need not necessarily be carried up to the ceiling; and it was generally agreed that, whether the corridor system was adopted or not, improvement in barrack accommodation is greatly necessary.

LADDERS FOR FIRES.

SIR,—With reference to the disastrous and fatal result of the fire at Richmond, one of the London papers states that "Mr. Lever, the manager, and Simpson, the clerk, were both at the windows, *calling loudly for ladders*;" and further adds, that, "Mingey, the cellarman, knowing there was a fifty-six-round ladder in the yard of the new hotel, got the two policemen present to go with him to fetch it, but their *united efforts were insufficient to remove it.*"

Now, it appears to me the days of such antiquated and inconvenient ladders at present in use are gone by, and that ladders *light* and *portable*, composed of *tubular iron*, galvanised, might be economically constructed *in short lengths*, and fitted together, or taken to pieces in a few seconds, by *two persons*, at most; such ladders, in addition to general use, to be supplied to all hotels, in a similar manner as ladders are to the magnificent hotels in New York, viz., fixed from some of the top-floor windows in rear of the building, and reaching within 12 ft. from the ground. There may be some such ladder combining the qualities I have described, at present made in this country. A SAFETY LADDER.

SEWAGE AND STRATEGY.

YOUR correspondent, "M. F. T.," has taken a wrong view of the subject referred to under the above heading,—viz., that the "Enemy" in advancing up the Thames upon London, could bung up our sewage outlet at Barking Creek, and thus poison London.

No city in the world has such a grandly organised scheme for the concentration of filth, and in the "weakness" suggested by your correspondent is our very safety.

The sewage of London, North and South, suddenly discharged upon an advancing fleet would inevitably produce a panic and a retreat, or death by poison.

We have to thank your correspondent's fears for the discovery of a new defence for the metropolis. L. A.

HOLY TRINITY CHURCH, BARNSTAPLE.

THE new church of Holy Trinity, at Barnstaple, in Devon, has been opened by Dr. Temple, bishop of Exeter. The church was originally built in 1846, but owing to its defective construction, fell so quickly to decay that the whole of it, save only the tower, has been entirely rebuilt. The tower is a Perpendicular one, standing 130 ft. high. It was somewhat higher, but has been lowered some feet, and advantage has been taken of the scaffolding erected for that purpose to carve the blocks left for ornamental purposes at the time of its construction. The new church, which is cruciform, follows nearly the plan of the old walls; with an extension westward of a few feet, and eastward by the addition of an apse. The nave, instead of being as before, in one single span, with walls comparatively low, is now divided into three parts. The central part has lofty walls, forming a clear-story, into which the old nave windows are incorporated, with new hooded curtain-ribs on the inside. There are now narrow side aisles, with small two-light windows, separated from the nave by an arcade on either side, of Hatherleigh and Ham-hill stone, with moulded capitals. The chancel aisles are covered with double roof transversely, and there is a narrow aisle to these, connecting them with the nave aisles by transverse arches. The old roof timbers are reconstructed, and the carved angels are used again for the corbels, but the apsidal roof of the chancel is carried on small vaulting-shafts with carved capitals. The old pews are reconstructed into open benches, and the chancel is fitted with stalls. The chancel is laid with Minton's tiles. A memorial window in stained glass in the south aisle is from a design of the architect; another is in course of erection for the east window, by Messrs. Powell. In the west window some coloured glass is introduced. The stonework of this window is made of the old work, but reduced from seven lights to five. The contractors were Messrs. Hartnoll, Pulsford, & Cox. The carving of the tower was executed by Mr. Harry Hems, of Exeter. The architect was Mr. W. White, London.

LONDON CORN EXCHANGE COMPETITION.

As one of the architects invited to prepare a design for rebuilding the Corn Exchange in Mark-lane, Mr. John Whichcord found it necessary to address a letter to the committee on certain objectionable points in the conditions, especially as to the circumstance that while the selected architect's design would be rejected if it could not be carried out for an amount within 10 per cent. of the sum named (20,000*l.*), the light and air rights of adjoining tenants might lead to a large expenditure, if not prevent the building being carried out altogether. The committee removed one of the objections taken, but refused to make any arrangements as to the latter; and Mr. Whichcord therefore declined to compete.

Other competitors will do well to keep this question of compensations in mind.

NEW POLICE STATION, IPSWICH.

AT the Quarter Sessions held at Ipswich last week it was resolved that the designs prepared by Mr. W. Oldham Chambers, architect, Lowestoft, for the new police-station in Ipswich, should be accepted by the county, and the same were ordered to be sent by the Clerk of the Peace to the Secretary of State forthwith.

The arrangement on the ground floor gives accommodation for the Petty Sessions, with magistrates' retiring-rooms, attorney and witnesses' rooms, lavatory, and so on. At the rear of the above, provision is made for six cells, contiguous to which is the constables' sitting-room, coat-room, bedding store, and the usual offices. The superintendent's department contains parlour, living-room, kitchen, and five bedrooms, with infirmary for sick prisoners if required. The constables are provided with five bedrooms, reached by a separate staircase from that used by the superintendent. It is intended to commence the works immediately the plans are approved by the Secretary of State.

CHURCH BELLS AND CHANGE RINGING.

A LECTURE on this subject was lately delivered at the Bury Athenæum, by the Rev. J. J. Raven, B.D., head-master of Yarmouth Grammar School. The chair was taken by the new president, Lord John Hervey. The rev. gentleman, having introduced the subject, said there was no metal which would not give a musical sound in some shape or other, yet bells from the earliest times seemed to have been made of pretty nearly the same material—common bronze. At first, however, they were not cast, but hammered into shape, and of course nothing like music could possibly be got out of them. He was not certain when the casting of bells was first introduced into this country, but certainly before the Conquest. The present mode of casting was much the same as that made use of centuries ago. About the year 1000 there must have been a great many bells in England. There were no bells in this district, however, of very great antiquity. The oldest, perhaps, was one at Wordwell, a queer, long-shaped bell, with no date upon it, so that they could not judge correctly of its age. Some of the inscriptions on bells were very amusing; there was one on a bell, in Ickworth Church, made by a man named Pleasant, at Sudbury, which was rather a puff:—

> "Henry Pleasant has at last
> Made as good as can be cast."

Another was:—

> "Henry Pleasant did me run
> In the year seventeen hundred and one."

Some of the inscriptions were historically valuable, as, for instance, this:—"I was cast in the year of plague, war, and fire, 1666." In later bells the churchwardens' names were put in as well as the founders, but in the present time, he was glad to say, they got wholesome inscriptions, not superstitious invocations, such as "Praise the Lord," "Give thanks to God," &c.

CHURCH-BUILDING NEWS.

Aikton (near Wigton).—The old parish church at Aikton, which has recently undergone a renovation, has been re-opened for divine service. The old church is a very ancient structure, and appears to have been built upon the site of an edifice of still greater antiquity; but of the anterior church there is no historical record. The remains which still exist exhibit rather a good example of the Norman style. The present church, which is composed of a nave, aisle, and chancel, appears to have been built in the thirteenth century. Before the recent improvements the church had fallen into a deplorable state of decay. It was, in fact, a complete wreck, and was damp and unwholesome. The old oak beams of the nave had been covered, probably some century ago, by a flat-plastered ceiling only 13 ft. from the floor. The floor was flagged, and very damp; the pews were of a very unsightly description, and much dilapidated, while the pulpit,—a structure of a rather uncomely appearance,—was stationed in the middle of the nave. Modern windows, of by no means ornamental construction, in the nave and aisle walls increased the unprepossessing appearance of the place; while the whole of the interior, including the pillars between the nave and aisle, which were of good dressed stone, were whitewashed. All this, however, has now been changed. The church has been repewed with open benches placed on a wood floor. The passage has been flagged and the chancel floor has been relaid with ornamental encaustic tiles. The north and south walls have been rebuilt, and the old windows have been replaced by grouped lancet windows, in the style in which the church was originally built. An entirely new roof has been put upon the aisles; and in the nave and chancel the plaster ceiling has given place to heavy oak timbers, at an altitude double that of the previous ceiling. When the old roof was removed, a somewhat singular phenomenon was brought to light, exhibiting rather a curiosity in church architecture. All the tiles were fastened together with portions of the shank bones of sheep. The work of restoration has been carried out under the direction of Mr. Birkett, of Carlisle, architect. Mr. Pearson, of Wigton, had the joinering; Messrs. Roper & Beaty, of Dalston, the masonry; Mr. Wilson Bell, of Wigton, the painting and plumbing; and Mr. Joseph Fell, of Wigton, the slating.

Albury.—A full choral morning and evening service has been held at Albury Church, in celebration of the opening of the new organ and chancel. The new chancel has been erected at the cost of the Duke of Northumberland, and improvements in the nave, if not its reconstruction, it is expected will take place next year. The present improvement—that of the erection of a new organ, in a new chancel, with artistically designed roof,—is a step towards introducing church architecture in a purer form into Albury. The new chancel is from the designs of Mr. A. W. Blomfield. The windows are filled after designs by Lady Rokewood Gage. The three at the east are memorials of her ladyship's father, Mr. Henry Drummond. An oak screen separates the chancel from the nave. This, and the oak stalls, were made by the contractor for the whole work, Mr. Inkpen, of Abinger.

Bedhampton.—The Church of St. Thomas has been re-opened, after undergoing extensive alterations. The work was commenced about a year ago, when Mr. E. A. Gruning, of London, architect, after making a survey, reported that to carry out the repairs and alterations most necessary a sum of 650*l.* would be required for the repair of that portion of the church the expense of which would fall upon the parish. In June the contractors, Messrs. W. Moore, H. Carrell, and M. Osborn, of Havant, commenced the work of restoration. The walls were cleansed of stucco and pointed; a new bell-turret, a porch, and a new vestry were erected; the pulpit was removed, and its place supplied by a carved one of modern style; a reading-desk was provided; gas laid on in the place of the dips formerly used; and many alterations, improvements, and additions were made. The principal feature in the church now is a stained-glass window, presented by Messrs. F. J. Lightfoot and Richard Hewitt, of London, and executed by the firm of Lavers, Barraud, & Westlake, of London, the subjects represented being the Crucifixion and the Last Supper.

Maidstone.—The Free Church of St. James, Maidstone, a mission church in the parish of St. Paul, has been opened by license from the Arch-

bishop. The building is of brick, capable of holding 200 persons, all the seats being free. The walls internally are built of white brick, red and blue Staffordshire bricks being introduced in the arches and elsewhere. At the east end is a group of four lancet windows, the arches of which are supported by red shafts, having Bath stone bases and caps, the latter left in block for carving; the whole window being enclosed by an arch in red brick. The west end has a large circular window in the gable; and below it right and left are coupled lancet windows: between them is the entrance. The western gable end is surmounted by a bell-cot in Bath stone, in which is hung a bell cast by Messrs. Warner & Sons, of London. The church is warmed on a patent principle by a Gill stove sunk under the floor. The lighting is by gas, for which gaseliers have been designed in accordance with the style of the building, by the architect, Mr. Hubert Benstead, and they have been executed by Mr. Golding, of this town. The builder is Mr. Henry Bridge.

Asterley.—A new mission school church at Asterley, a small outlying hamlet of the parish of Pontesbury, has been opened. The church is a simple and unpretending structure of brick, built in the Early English style, and having an apsidal chancel. Its extreme length is about 60 ft., and its width 18 ft. The nave is divided into five bays marked externally by deep buttresses, and having coupled single-light windows in each, whilst the chancel has loftier single-light windows breaking up into the roof by gablets. At the western end a bell-cote, terminated by a wrought-iron cross, distinctly marks the character of the building; and the porch, of timber construction, occupies the westernmost bay of the south side of the nave. Internally the walls are left unplastered, and the warm appearance of the brickwork forms a variation to the usual whitewash. The roof is an open one. The chancel is formed by a raised step, on which is placed a perforated low screen of woodwork, behind which are seats for the choir, of a more ornamental character than those of the nave. Beyond the choir rises the sacrarium, elevated three steps above the nave floor. The sacrarium and choir are laid with Shropshire tiles, from Messrs. Maw's works at Benthal, and the central window of the apse is filled with a stained-glass window, having for its subject the Crucifixion of our Lord. The church is nominally constructed to accommodate only 125 persons, but 180 found sitting or standing room in it at the opening. The edifice has been built by Mr. R. Yates, of Shifnal, from the designs of Messrs. Paull & Robinson, of Manchester. The fittings, some of which are available for school purposes, were made by Messrs. Sidebotham & Co., of Manchester. The altar furniture was made from the architect's design by Messrs. Jones & Miller, of Birmingham; and Messrs. Edmundson, of Manchester, supplied the stained glass, also from the architect's drawings. The font is the work of Mr. Yates, the contractor. The site on which the church stands was given by Mr. Henry Gardner, of Westley.

Bawtry. — Harworth Church has been re-opened for divine service after restoration. Mr. C. J. Neale, of High Oakham, near Mansfield, was engaged as the architect. Plans having been prepared and approved of, the contract for the work was undertaken by Messrs. Robert Wood & Son, of Doncaster. The work includes the re-erection of the whole of the body of the church and the chancel, with the addition of two new transepts, each 17 ft. by 15 ft., a vestry, and an organ-chamber. The chancel arch and the arch at the entrance from the porch, from their being Norman in style, have been retained. The church has been built with wallstone obtained from the neighbourhood, and is dressed with ashlar stone, supplied from Ancaster. The tower is the same as before. The style of the previous building has been retained,—that of the Early Decorated. The floor of the chancel, and within the communion-rails, has been laid with encaustic tiles, supplied by Messrs. Maw & Co., of Broseley, Shropshire. As regards the interior arrangements, very little difference from the former church is perceivable, the old stalls, reading-desk, and pulpit having been nearly refixed. The church will henceforth be heated with warm water. The cost of the restoration has been about 1,450*l.*, most of which is already contributed.

Bristol.—For the proposed alterations in the Mayor's Chapel, plans have been prepared by Mr. Butterfield, architect, according to which it is intended to place the organ in the recess in the tower; by which means the general effect of the building will be more spacious. It is also proposed to make some alterations in the sittings, so as to move the "Red Maids," who now crowd close upon the altar-rails, further back into the building. The local *Times* hears it is contemplated to have large repairs and additions made to the organ, before it is re-erected. The cost of the whole, it is estimated, will not much exceed 500*l.* The matter will again be brought before the council before the plans are confirmed.

PROVINCIAL NEWS.

Baldock. — For a proposed town-hall for Baldock donations amounting to upwards of 800*l.* have been promised. It has, however, been resolved that a site shall not be purchased until 1,000*l.* have been subscribed.

Rickmansworth.—The completion of the new town-hall has been celebrated by a public dinner. The new building has been erected by a limited liability company (with shares of 5*l.* each) on the site of the old market-house, which had stood for many years in a most dilapidated and unsightly condition. The present structure is built in the Domestic Gothic style of architecture. The assembly-room is 56 ft. long, 27 ft. wide, and about 22 ft. high. It is well lighted, having five windows an each side. The roof is light, being a hammer-beam roof with an intertie of wrought iron. There are stone corbels supporting the roof, which will be carved when the funds permit. The artificial illumination is furnished by two sun-lights. The hall will accommodate 400 persons, or about 350 after deducting the space necessary for a platform and gangway. There is an ante-room at its southern end, and at its northern end a magistrates' room, nearly 30 ft. long, and about 15 ft. wide. In addition to these rooms, there are two other ante-rooms and a "cottage" for the hall-keeper to live in. The front of the building is of red brick and Bath stone, and over the entrance-doorway is a gable-turret, in which it is intended to place a clock. The cost of the erection has been about 1,200*l.* Mr. Arthur Allom, of Westminster, was the architect. The contract was divided between Mr. T. Holland and Mr. H. H. Hudson, builders, Rickmansworth. Mr. A. Allom was the architect of Lord's Grand Stand.

Hartshill.—The new buildings of the North Staffordshire Infirmary at Hartshill have been opened by the Duchess of Sutherland. The high sheriff opened the proceedings by presenting an appropriate address, to which her Grace responded in an able speech, in the course of which she said:—"I trust that I may be allowed earnestly to commend the claims of this house of mercy to the heart of every woman in this neighbourhood, who may have the honour of ministering, by her personal presence or otherwise, to its suffering occupants. I must also venture to express the hope that no feelings of sectarianism, arising from divisions among those who differ in forms only, may be allowed to weaken the unanimity required for the support of this charity. I will with the greatest pleasure convey to their Royal Highnesses the Prince and Princess of Wales the intelligence of the completion, under God's blessing, of the building, the foundation-stone of which was laid by his Royal Highness, and graced by the presence of the Princess, and the object of which is one that has always her tenderest sympathies.

Frant.—The Thompson Memorial Reading-room has been opened. It includes a residence for the schoolmaster and schoolmistress of Frant school. The building is erected as a memorial of respect and gratitude to the late Rev. Sir Henry Thompson, bart., the funds for which were raised by subscription amongst the parishioners of Frant. The building is situated at the back of the school, and is fronted with white bricks and red tiles, and is of that peculiar style of architecture which is usually seen on land belonging to the Earl of Abergavenny. The cost of the building is between 500*l.* and 600*l.*

Watford.—It is proposed to erect here an Agricultural Hall, by means of a subscribed capital of 3,000*l*, in 5*l.* shares, and the sum of 2,200*l.* is already subscribed. The active agent in this movement is Mr. Alfred Sedgwick, the hon. secretary to the West Herts Agricultural Society.

Lewes.—The Visiting Committee of Justices propose that accommodation should be provided in the County Lunatic Asylum for fifty additional female patients, at an estimated cost of 3,600*l.* The plans and estimates have been prepared and laid before the Home Secretary.

York.—After the conclusion of business in the Corn Exchange on Saturday last, Mr. F. Carr said there was now a prospect of having a covered market erected in this city, as the corporation would apply for an Act in the next session of Parliament. There had been a great fight as to where the market should be placed. The site had been determined upon, but he heard with very great regret that there was a sort of opposition to having a covered market on that site at all. He, however, trusted that there were no persons, either in or out of York, who were really bent upon opposing this desirable scheme, considering that a covered market had been wanted for so many years.

East Retford.—The new Temperance-hall, in Chapel-gate, for the Band of Hope and Temperance Society, has been opened. The building was formerly used by the Exchange-street Temperance Society, but was bought by the Chapel-gate Society for 300*l.* Messrs. Bellamy & Hardy, of Lincoln, were employed in the preparation of the plans for the alterations proposed to be made in the building, and under the direction of these architects the works have been carried out by the contractors, Mr. Liller, carpenter; Messrs. Bailey, gasfitters, &c.; and Mr. Pollard, decorator and painter. The main hall is capable of accommodating about 500 persons. The room is lighted by a number of statuettes placed round the wall, and each bearing two lights. There are a workmen's reading-room, committee and waiting rooms, one of which, behind the stage, can be turned into an orchestra at small trouble.

FROM SCOTLAND.

Bucklyvie.—The new waterworks, which have just been completed, at Bucklyvie, have been inaugurated. The village, till the present time, has been supplied with water from a brook which runs along by its side; but about two years ago a water company was formed. A spring on Upper Caithley Farm, from which the water is principally obtained, was measured, and it was calculated that the supply from it, amounting to 2,000 gallons in twenty-four hours, would be adequate for the demands of the population, which numbers about 350. The ground was surveyed by Mr. Alexander Malcolm, jun., Balfron; and estimates having been procured, it was seen that the supply might be obtained at a cost of about 150*l.* The capital was soon subscribed, in 1*l.* shares, by upwards of twenty shareholders; and the contract was undertaken by Mr. Archibald Merrilees, plumber, &c., Stirling. The contract embraced the laying down of 1,234 yards of 2½-in. cast-iron pipe, and 134 yards of 1½-in. pipe, the erection of wells, construction of cistern, &c. The water is collected from the spring which rises near Caithley Burn, and runs about 50 yards into the cistern; it is then conveyed through cuttings, in some places 8 ft. deep, down to the Culbowie-road, and into the village. The fall is considerable, and the pressure is good. It is thought that a water-rate of 1*s.* will amply repay the capital expended. Many of the residents have taken the water into their houses.

Books Received.

The Legend of Christian Art, illustrated in the Statues of Salisbury Cathedral. By the Rev. H. T. ARMFIELD, M.A. Salisbury: Brown & Co. London: Simpkin, Marshall, & Co.

THE statues in the external niches of Salisbury Cathedral have been restored, whether well or ill it is unnecessary for our present purpose to say; and Mr. Armfield, who is a minor canon of Salisbury, observing how few amongst the multitude of spectators who gaze upon them were able to identify any but the most familiar of the figures, has written this little book for their elucidation. Inasmuch, however, as these figures represent some of the most famous saints of Western Christendom, the volume has a wider use, and may be regarded as a useful handbook for architects and others engaged in ecclesiastical art, as well as for visitors to galleries and cathedrals at home and abroad. Many of the latter certainly lose much of the interest hidden in what they look at through want of such information as is here set forth. Husenbeth's "Emblems of Saints," which, though useful as a pocket companion enabling tourists to identify saints, does not give the reasons why particular emblems have been assigned to them, shows how

large a number of personages whose effigies occur are not mentioned by Mr. Armfield. Still his book is useful as far as it goes, and those who want fuller information on the subject may consult Père Cahier's book, "Les Caractéristiques des Saints dans l'Art populaire, énumérées et expliquées." The "Legenda Aurea" (Golden Legend) and Mrs. Jameson's "Sacred and Legendary Art" have, of course, supplied Mr. Armfield with much of his information. The legend of St. Osmund, the originator of the "Use of Sarum," is taken from a Latin MS. in the British Museum, which the author believes has never before been printed. Of course, we do not ask our readers to believe all these tales. Mr. Armfield says on this point,—

"Our own attitude towards these legends, whether as writers or as readers, I could wish not to be mistaken. It is, of course, no part of my present business to establish or defend them. But one thing about them will be admitted by all. Although from the change in the modes of European thought and feeling, which the critical spirit of modern times has introduced, we may smile at the extravagance, the disregard of all the laws of incident everywhere discernible in these Mediæval legends, yet it is impossible for any thinking man not to read in them the history of processes in the inner life which are being continually reproduced within the compass of our own individual experience; impossible not to recognise in their details the features of exalted ideals of character, a unity of lofty purpose and an heroic devotion to duty, which will to the last command the admiration and the sympathy of mankind."

Construction of Hospitals. By DOUGLAS GALTON, C.B., F.R.S. London: Macmillan & Co. 1869.

OUR readers will remember that Captain Douglas Galton read an address on the general principles which should be observed in the construction of hospitals before the British Medical Association in Leeds. This he has now wisely published, with illustrations and a report of the discussion that followed the reading. A full account is given, as appendix, of the ventilating fire-place, founded on General Morin's experiments. We take exception to Captain Galton's observation in the preface, suggesting that improved hospital construction is to be dated from the Report of the Royal Commission on the Sanitary State of the Army of 1857. But we may have another opportunity to look to the address generally.

VARIORUM.

"ADDISON'S Essays from the *Spectator*," as just now issued by Tegg, make a volume of enduring value and interest. Addison, as an essayist, has long influenced society, and will continue to do so; and it was a good thought to bring his work together in a compact form, cleared from inferior matter. It is unnecessary in this place to inquire if the editor has not included some few essays by other contributors to the *Spectator*. The object of the volume is not to settle what Addison did and what he did not write: here, at any rate, we have the great bulk of what he contributed to that famous serial. ——The January *Quarterly* is good and varied. An article on the Land Question in France will pay for attention, especially at this moment. The Laureate gets but scant justice at the hands of the reviewer of "The Holy Grail." Mrs. Stowe's "Vindication" is rightly knocked about. —— "Hints on Sanitary Reform; with a Plan for the Disposal of the Sewage and Débris of Glasgow. By James Gray, M.D., and Robert Baldie, Architect. Glasgow: Cairns & Co." The authors of this pamphlet propose to convert the sewage and *débris* of Glasgow into artificial guano, and purify the Clyde by a scheme of drainage and conveyance through intercepting sewers down the river banks on both sides as far as Newshot Island, where tank pond and other works would be used in converting the sewage into artificial guano, the purified water being allowed to pass there into the river. As many as twenty different schemes for disposing of the Glasgow sewage have been projected within the last ten years. —— "Prison Discipline, with some Suggestions for its Improvement." This is a letter addressed to Mr. Henry Pownall, chairman of the Middlesex magistrates, by Mr. A. Angus Croll, J.P., late high sheriff of the city of London, &c. The author takes our side of the question; urging the useful employment of prisoners. He says,—

"I feel a strong aversion to the costliness of our present system. The plan which I propose would, I think, bring with it a very great saving of expense. Why should the mass of skilled and unskilled labour within the walls of our prisons be almost entirely unproductive? Might it not be employed so as to produce some return? I cannot but think that something might be effected. I feel sure that something ought to be attempted, in this direction."

He proposes to extend and develope the principle of employing prisoners in their own trades,—a principle, as he observes, already to some extent in operation. He would only keep them above starvation point, leaving all beyond that to their own exertions and wages:—

"All I contend for is that a true system of prison-discipline should include the following points:—
1. That in the classification of prisoners they should be grouped according to their trades and professions, each man following his own proper calling, and receiving better or worse accommodation in proportion to his earnings.
2. That if a prisoner will not work, neither shall he eat, except the poorest fare and in the scantiest quantities.
3. That all beyond this shall be dependent on the man's own exertions.
4. That a contribution be levied upon the proceeds of the convict's industry in payment for the rations provided by the prison authorities.
5. That an adequate motive to work be provided, and that the motive be of the same kind as that which actuates those who are at liberty."

——"A Chart of Industrial Life, with some Instructions for its Use. London: Simpkin & Marshall." The word "chart" is here used as a figure of speech relating to the avoidance of obstacles and dangers in industrial life:—

"To sum up," says the author, "intelligence and goodness of disposition are indispensable qualifications to enable mankind to enjoy well-being in its highest form. Without real education extended to all children, these qualifications will not prevail among adults. And since children cannot provide education for themselves, all adults who are not indifferent to the happiness and improvement of society must lend their aid to have it provided for them. If this be true, the neglect and misdirection of education in times past fully account for the number of destitute and miserable to be found in every country. And if similar neglect and misdirection are persisted in, the number of destitute and miserable among us will remain undiminished.

Parents in some countries expose or kill their children. In others, they passively permit them to grow up ignorant, vicious, and miserable. The latter condemn the former for their cruelty, their barbarity. The retort of the former is frightfully crushing. Let it be our endeavour, while we keep free from the guilt of destroying our children, not to deserve their reproaches for suffering them to live."

Miscellanea.

Completion of the Liverpool New Exchange Buildings.—The reconstruction of the Exchange Buildings, of which a view and description have already appeared in the *Builder*, has now been completed. The present quadrangle, like its predecessor, is surrounded on three sides by an arcade, but, unlike the old one, the new arcade stands before the building, except at each end, where it is terminated by a *pavilion*, and in the centre of the north wing, where it passes under the principal tower. The architectural effect of the new building is very different from that of the old: the latter partook of the Palladian character of the town-hall. Outside the quadrangle, in the streets which bound the property of the company, the exterior of their buildings has greatly improved the aspect of this part of the town. In Exchange-street East the alignement of the property has been altered, so as to bring that front into range with the Liverpool and London Chambers, and the turret at the corner of Tithebarn-street forms an agreeable termination to the view from Dale-street. At the foot of this turret, as in Tithebarn-street, Chapel-street, and Exchange passages, east and west, various other improvements have been effected, whereby the convenience of the public and the appearance of the buildings have been promoted. The architect of the new edifice was Mr. T. H. Wyatt.

Great Strike of Workmen in France.—A general strike took place recently among the workmen at the iron-works of M. Schneider, the president of the Corps Législatif. About 10,000 persons at Creuzot left off work. The origin of the strike had to do with an offer spontaneously made to the workmen by the manager to leave to the men the direction of their own savings-bank: it had nothing to do with wages. The strike commenced first in the building workshops, whence the leaders proceeded to the forges, furnaces, and mines, where they successively induced the men to join the strike. The strike, however, seems to have ceased as suddenly as it occurred.

Death of Mr. Broome, of the Temple.—We regret to hear of the death of the celebrated gardener of the Temple, Mr. Broome, whose crysanthemums and pompons are so well known to the citizens. The readers of the *Builder* were among the first to have their attention drawn to Mr. Broome's merits. He published a book on his favourite flowers which he did much to render popular; and the Londoners were greatly indebted to him for the floricultural improvement of their squares and open spaces.

The Approaching Census. — Dr. Begg urges, as we did previously to the last census, that information by its means should be obtained respecting the state of the houses of the people. This was done in regard to Scotland at the last census after some difficulty, and it would be most valuable with reference to many social questions if similar information could now be secured for the United Kingdom. The points ascertained in regard to Scotland were the number of rooms in each house, the number of persons in each family, and whether the houses had or had not windows. The following was the curious and instructive result for all Scotland:—Houses without windows, 7,964; houses of one room, 226,723; houses of two rooms, 246,601; houses of three rooms, 75,933; houses of four rooms, 37,186; houses of five rooms, 19,910; houses of six rooms, 15,278; houses of seven or more rooms, 37,191; total houses in Scotland, 666,786. The full details were given at the time also in a tabulated form in regard to Edinburgh and Glasgow, and are not only very instructive, but have given a great impulse to social and sanitary improvement in these cities. If similar details were now given for every city and town in the empire, and if they were continued every ten years, we should not only lay a solid basis for social science in regard to disease, pauperism, and other evils, but we should be able to compare one town with another, and from time to time the kingdom with itself.

Metropolitan Fire Brigade Statistics.—The report to the Metropolitan Board of Works of the chief officer of the Metropolitan Fire Brigade has been printed. From this report it appears that 1,784 calls were received during the past year; that 120 were false alarms, 92 chimney alarms, and 1,572 calls for fires, of which 199 resulted in serious damage, and 1,373 in slight damage. The fires of 1869 show a decrease of 96 compared with those of 1868; but compared with the average of the last ten years there is an increase of 230. These lists do not include trifling fires or chimneys on fire. The energy and activity of the firemen are shown by the fact that amongst the brigade of 378 firemen there were 102 accidents from contusions, wounds, sprains, burns, &c. Amongst causes of fires prominent places are held by the candle, the lucifer, tobacco, the fire-spark, the airing of linen, defective, foul, and blocked up flues, gas-escapes, and swinging brackets, paraffine, stoves, &c. Out of 1,572 causes specified, the candle is set down at 202, the fire-spark at 133. The next is 45 from smoking tobacco, and gas-escapes and flue fires follow next in order.

St. James's Church, Aldgate. — At a meeting of the City Commission of Sewers on Tuesday last, with reference to this church, of which the members of the Court of Common Council are the patrons, information was given that the edifice was in such a dangerous condition that no services could be performed in it, and that no funds were in hand to restore the fabric. Mr. John Young, the district surveyor, had reported that the arched ceiling over the entrance to the church had sunk, and was in a dangerous state, that the external walls were fractured, and were also dangerous; that the pillars were broken and decayed; and that the belfry windows likewise required repair. The expense of shoring up the church was reported at 25*l.* or 30*l.* The necessary steps were thereupon ordered to be taken. A letter on the subject has been written by Mr. Daw to the town clerk, with a request that it might be brought before the notice of the Common Council. With them rests the question whether the structure shall be restored or not, or whether the amalgamation of the benefice with the adjacent one of St. Catherine, Cree shall be effected.

Free and Cheap Steel for Rails, &c.—It is expected that the approaching expiration of Mr. Bessemer's patent for converting pig-iron into malleable iron, and that again into steel, without any additional consumption of fuel, will tend in a considerable degree to the future safety of railway passengers. The patent will come to an end in February, and as a result, it is expected that steel rails, which have hitherto been almost too expensive to be used, will fall to a price a very little above that of the best iron. The projectors of new street tramways now will, no doubt, avail themselves of this material. Mr. Bessemer first communicated an account of his process to the meeting of the British Assoication at Cheltenham in 1856.

New Cemetery for Bingley.—In accordance with a notification given to the newly-formed burial board for the parishes of Bingley and Holy Trinity, Mr. P. H. Holland, of the Burial Acts Office, Whitehall, has visited Bingley for the purpose of inspecting the site of the proposed cemetery. Mr. Taylor (of Taylor & Garthwaite, architects and surveyors, Bradford, who are instructed to prepare plans for the laying out of the cemetery), and several other gentlemen, members of the Board, and ratepayers, attended. The site of the cemetery is at the north-west end of the town, and consists of ten acres of rising and undulating ground, which have been purchased for 3,500*l*. After Mr. Holland had gone over the ground, a meeting was held in the Mechanics' Institute, but no formal objection was submitted; and the vicar, although he disapproved of the entrance to the cemetery being formed so near his residence, stated that he should not oppose the public convenience. A resolution requesting Mr. Holland to recommend the Home Secretary to approve of the site was then unanimously adopted.

Archæological Discovery.—An interesting discovery has just taken place at Tolethorpe, near Stamford. Whilst excavating in the grounds of Mr. Charles Ormston Eaton, the workmen came upon the foundations and other remains of an ecclesiastical building of the fourteenth century. In Blore's *Rutland*, we find it recorded that "Before the year 1300, Sir John de Oketon and Alice his wife, presented a clerk to the church of Little Casterton; but whether they were owners of the manor of Tolethorpe I have not been able to discover; it is probable, however, that John de Oketon is the same person with John de Tolethorpe, who in the year 1301 founded in Tolethorpe an hospital for seven poor men, and a chantry for the benefit of his soul." The writer adds, "all the inquiries I have made relative to the chantry of Tolethorpe have not procured for me the least information as to the site of the chapel or other places of worship, of that religious foundation."

Rotherham Hospital and Dispensary.—The foundation-stone of the proposed hospital and dispensary at Rotherham has been laid with Masonic honours by the Right Hon. Earl de Grey and Ripon, K.G., Lord President of the Council, Deputy Grand Master of England, and Provincial Grand Master of the West Riding. In the selection of a suitable design for the new building, the successful competitors were Messrs. Mallinson & Bakewell, of Leeds. The contract was let to Messrs. Askew Brothers, Parkgate, for 4,680*l*. The Tudor style of architecture has been adopted. The total length of the building will be 260 ft., and the breadth from front to back 180 ft., each department occupying a separate block, and being entirely isolated. The principle of isolation will, in fact, be extensively adopted throughout the building, while each ordinary patient will be allowed 2,000 cubic feet of space, and those of the special wards, 2,500. The total sum subscribed and promised is upwards of 6,000*l*., which will about meet the probable cost of site and buildings; but about 2,000*l*. more will be required.

Premiums for Odours.—As an encouragement to colonial flower farmers, various premiums have been placed at the disposal of the council of the Society of Arts, for the term of seven years, by Dr. Septimus Piesse, F.C.S., including 5*l*. for one pound of Otto of Bergamot, of the value of 16s. or more in the London market, being the produce of plants (*Citrus bergamia*) grown in Australia, New Zealand, Natal, any of the British West India Islands, or any other British colony or dependency; 5*l*. for one ounce of Otto of Roses, of the value of 20s.; and 10*l*. for a canister of enflowered butter or fat, scented with any kind or sort of flower,—all the product of the same colonies.

Poor-rate Valuation Lists.—A Poor Law Board return for 603 of the unions in England and Wales shows that in April the valuation lists had been completed in all but ten of them. The amount as settled by the assessment committee, in the valuation lists last approved, of the gross estimated rental, was 95,974,617*l*. The amount of rateable value on which the contribution to the common fund was calculated at Lady-day, 1868, was 79,790,257*l*., being about four-fifths of the rateable value of the whole of England and Wales. The expenses incurred by the committees in the year 1867-68 amounted to 35,176*l*., and in 1868-69, 32,767*l*.

Earthquake-proof Churches.—A Philadelphia letter in the *Times* says:—The people of California, since the earthquakes of 1868, have a great dread of recurring shocks. We have intelligence from San Francisco that the Roman Catholics are building there "an earthquake-proof church." The side walls above the basement are only 30 ft. high. At this height a roof rises, which, with the main roof, is supported independently of the walls by two rows of pillars inside of them. Both roofs are firmly bound to the pillars, and the pillars are fastened together by iron cross-beams, secured with heavy iron bolts, forming a network of great strength. The theory of the plan of construction is, that should the pillars be shaken down, the roof would be launched off outside the walls, instead of falling inside, thus giving a chance of escape from the ruins. In thus falling, the roof would be carried aside a distance of 80 ft., the length of the pillars.

The Decoration of Rudford Church.—The decorative work has been proceeding under the hand of Mr. Meek, of Kingsholm, Gloucester, directed by Mr. Gambier Parry, and at the cost of Mrs. and Miss Price, who gave the organ. This decorative work is now finished. The base of the walls is chocolate, with cream colour above. The mouldings of the chancel arch, with its dog's-tooth ornament, are picked out in various colours; the organ-front showing beyond the arch. There is diaper work at the east end, with the sacred monogram in gold; and the chancel shows a blue firmament, powdered with gold stars. More colour has been added, and texts have been painted around the walls and over the chancel arch and communion-table.

Memorial Tomb in Abbot's Leigh Churchyard.—In this churchyard there has just been erected a tomb in memory of the late Lady Miles, wife of Sir W. Miles, bart., of Leigh Court, and of one of their children. The design was furnished by Mr. Pope, architect; and Mr. Pavey, marble mason, Clifton, has executed the work. The tomb, as described in the *Bristol Times*, consists of a red Mansfield base, with chamfered gray plinth, surmounted with a red granite mitre ledger, with an elaborately-carved marble cross lying in relief on the ridge. At the head and foot of the tomb stand two ornamental crosses, different in character, on a red granite plinth. The whole is surrounded by a stone edging, enclosing an area of about 10 ft. by 8 ft., with a low ornamental railing.

Proposed New Corn Exchange for Doncaster.—It has long been contemplated by the town council of Doncaster to erect a new Corn Exchange adjoining the present Market Hall, and in close proximity to the Cattle and Wool Markets. The question was again mooted at a council in committee. Mr. Watkins's plans were again brought under consideration; and after considerable discussion, it was agreed that Mr. Watkins, of Lincoln, architect, be instructed to prepare estimates, in accordance with his amended plan, of the cost of the proposed new Corn Exchange and south-east wing, and submit them to the council without delay.

Presentation of a Testimonial to the Ex-Borough Surveyor of Penzance.—We observe, from the *Cornish Telegraph*, that a public recognition has been made in the town-hall of the services of Mr. John Matthews, who has lately, from ill-health, resigned the borough surveyorship of Penzance, which he had held during the space of a quarter of a century. A purse of 500 sovereigns, a massive silver salver, and a parchment bearing the best good wishes of a host of friends, were offered to him on his retirement from the more active and laborious duties of his office. The salver bears this inscription:—

"Presented to Mr. John Matthews, with a purse of 500 sovereigns, by the corporation and inhabitants of Penzance and the neighbourhood, on his retirement from the office of borough surveyor and engineer. This testimonial marks the high sense of public respect and esteem for his integrity and ability, during a period of twenty-six years. 14 January, 1870."

Destruction of a Statue about to be Cast in Bronze.—The sculptor Marcello—a pseudonym for the Duchess Colonna, the author of two busts of Marie Antoinette, and other works,—has just had a sad mishap. She had sent to Paris, from Rome, a statue to be cast in bronze by one of the best French artists. This work has arrived broken to pieces. The duchess has thus lost a year's labour.

The Treatment of Sewage with Carbon. Mr. R. Hinde, of Lancaster, writes us, pointing attention to the fact, corroborated by a reprint from the *Lancaster Guardian*, as to proceedings in 1849, that at that time he had not only proposed the treatment of sewage with carbon, but had successfully practised the process at Lancaster. Neither does Mr. Hinde claim the origination of the process, but names Mr. Jasper W. Rogers, and Mr. Clarke, a London manure manufacturer, as having claimed it at that time. These names, and especially that of Mr. Jasper Rogers, many of our readers will remember in this connexion. Mr. Hinde, therefore, does not understand why a process such as that described by Mr. Johnson as having been tried at Newcastle should have been patented.

Opening of Public Baths for Stroud.—The public baths just provided for Stroud by a company headed by Mr. Dickinson, M.P., are now practically open. The Turkish bath is heated on a patent principle, providing a constant supply of fresh air from without, which, in passing through the warming apparatus, can be heated to any temperature up to 200 degrees. Under this principle of heating the oppression usually experienced by persons in most Turkish baths is said to be avoided. The swimming-bath is fitted with a shower in its centre, which keeps the water in continual motion. The cost of the baths is about 1,500*l*.; the subscriptions from shares and donations amount to 750*l*.; and there is therefore a deficiency of 750*l*.

Strike in the Building Trade in Edinburgh.—Messrs. Beattie & Sons, while building under contract the new city poorhouse at Craiglockhart, were met with a demand on the part of the men for an increase of a farthing per hour in their rate of pay. The masons were then receiving 6½d. per hour, and 6½d. was demanded. As the Messrs. Beattie were, in terms of their contract, compelled to have the poorhouse erected within a specified time, they acceded to the demand of their men. The poorhouse is now finished, and a few weeks ago Messrs. Beattie intimated that they would again reduce the rate of pay to 6½d. per hour. The men objected, and about 130 have struck work.

Society for the Encouragement of the Fine Arts.—The first *conversazione* for the season was held on Thursday evening, 27th inst., in the Gallery of the Female School of Art, Queen-square, Bloomsbury. On the 10th of February Mr. Hyde Clarke will lecture on the Culture of the Fine Arts in its influence on industrial pursuits.

Wanton Mischief.—A few nights since a gang of roughs smashed the stained-glass window and otherwise damaged the edifice of Heath Church, near Leighton Buzzard, Beds: previously to this they unhinged every gate between the two places, pulled up turnips, unearthed potatoes, and threw stones into the bedroom windows of peaceful inhabitants.

Paper Houses.—The American invention for paper building material has been recently tested in Chicago, with the result, we are informed, of establishing its utility. It is said that a house, 22 ft. long, 16 ft. wide, and 14 ft. high, can be covered on the outside for less than 9 dollars; and a house 16 ft. by 22 ft., and 20 ft. high, for 20 dollars.

Columbia Market.—The twenty-four iron pillars have been erected in the centre square, and the cross-beams are already placed, and by the close of this month "the covering-in" will be completed. There will be a stand or rostrum at each of the centre pillars, for "fish auctions." The paving of the covered square will be asphalted over, and the market lighted.

Her Majesty's Board of Works.—Mr. Fergusson having resigned the office of Secretary of Works, under the Board of Works, it has been resolved to make new arrangements respecting the works and buildings in connexion with the public service. Capt. Galton, C.B., F.R.S., has been appointed to the office of Director of Works.

Art Workmanship Competition at the Society of Arts.—In response to the offer of prizes issued by the Council in 1869, 143 specimens have been received for competition in the various subjects for which the prizes have been offered. These articles will shortly be arranged for exhibition in the Society's great room.

The Royal Irish Academy, at their last meeting, according to *Nature*, approved of some alterations in the bye-laws proposed by the council. By these alterations the council for the future will be divided into two committees, one of science, consisting of eleven members, and one of Polite Literature and Antiquities, consisting of ten members. The Committee of Publication is to consist of four members from each of the Committees of Council.

The "Danger of Introducing" Painted Windows.—The prize for the best essay "On the Use and Abuse of Music in Public Worship, and the Danger of Introducing Painted Windows in Churches," has been awarded to the Rev. J. Gritton, secretary to the Lord's Day Observance Society.

The Utilisation of Sewage.—This question has been again discussed at the Surveyors' Institute. A general opinion was expressed that the application of town sewage to land would ultimately be found the most advantageous way of meeting a difficulty which has so long existed.

The Subway, Westminster Bridge.—We may as well add to the information given in our last under the heading "Works at the Houses of Parliament," that to render the subway damp-proof in every respect, it was encased in Pyrimont asphalte.

The Greek Church, Liverpool. — Mr. Sumners has sent us copy of correspondence on the subject of the authorship of the design of this building. It shall have attention when we give particulars of the church.

The Queen's Library.—It is understood that Mr. R. Holmes, of the British Museum, will obtain the appointment of librarian to the Queen, vacant by the death of Mr. Woodward. We believe the candidates were numerous.

St. Mary's, Mistley.—The work in marble and alabaster, and the carving in this church, were executed by Messrs. Chinnock & Co., Ipswich. The pulpit and font are well spoken of.

TENDERS.

For alterations and additions to the Baptist Chapel, Silver-street, Taunton. Mr. J. H. Smith, architect :—

Aplin	£840 0 0
Dinham & Manning	736 0 0
Giles	698 0 0

For alterations at the Duke's Head Hotel, Margate, for Mr. J. Sharpe. Mr. W. Lane Sear, architect :—

Bushell & Son	£1,363 0 0

For building a photographic studio at Margate, for Mr. H. Goodman. Mr. W. Lane Sear, architect :—

Wharton	£749 0 0
Bushell & Son	638 0 0
Sayer	550 0 0

For partly rebuilding the Britannia Inn at Margate, for Messrs. Cobb & Co. Mr. W. Lane Sear, architect :—

Shrubsole	£698 0 0
Brown & Son	640 0 0
Simmons	635 0 0
Bushell & Son (accepted)	480 0 0
Hayward	477 0 0

For erection of baths and assembly rooms, at Southsea, Hants, for the Southsea Baths and Rooms Company (Limited). Messrs. Davis & Emanuel, architects :—

For Builder's Work.

Doverwood & Co.	£12,424 0 0
Bramble, Brothers	10,250 0 0
Pook	9,920 0 0
Nightingale	9,876 0 0
Stevens	9,548 0 0
Larcome	9,259 0 0
Burbidge	9,186 0 0
Quick	9,153 0 0
Ward	9,079 0 0
Absalom	8,850 0 0
W. H. & C. Light	8,651 0 0
Sanders	8,499 0 0
Barnes	8,370 0 0
Neave & Fry	8,333 0 0
Nance	8,250 0 0
Smith	7,395 0 0

For Engineer's Work.

Rigg	£2,576 12 7
Phipson	2,080 12 0
Bacon & Co.	1,978 0 0
Truss	1,945 0 0
Jennings	1,725 0 0
Topham & Co.	1,640 6 8
Jukes, Coulson, Stokes, & Co.	1,607 0 0
Gimson & Co.	1,428 0 0
Grant	1,023 0 0

For the erection of stabling in rear of the Adam and Eve Tavern, No. 1, Hampstead-road, Messrs. Richardson & Waghorn, architects :—

Scrivener & White (accepted)	£2,059 0 0

For the erection of stabling in rear of Nos. 19 & 21, Hampstead-road. Messrs. Richardson & Waghorn, architects :—

Merritt & Ashby (accepted)	£1,080 0 0

For alterations and repairs to No. 48, Portland-place. Mr. W. A. Baker, architect. Quantities by Messrs. Richardson & Waghorn :—

Haward, Brothers	£3,900 0 0
Clark & Mannooch	3,479 0 0
Keyes & Head	3,335 0 0
Simpson & Son	3,280 0 0
Phillips & Son	3,267 0 0
Ebbs & Son	3,249 0 0

For alterations and repairs to No. 85, Harley-street. Mr. W. A. Baker, architect. Quantities prepared by Messrs. Richardson & Waghorn :—

Cowland	£1,416 0 0

Sundry repairs, &c., to premises at Limehouse. Mr. S. G. Foulkes, architect :—

Woodward	£300 0 0
Brown (accepted)	260 0 0

For additions to Elm Lodge, Surbiton, for Mr. C. Owtram. Messrs. T. H. Rushforth & C. L. Luck, architects. Quantities supplied by Mr. Northcroft :—

Johnson & Gilby	£1,815 15 3
Dove, Brothers	1,655 0 0
Haward, Brothers	1,654 0 0
Simpson	1,600 0 0
Gammon & Son	1,566 0 0
Higgs	1,540 0 0
Manley & Rogers	1,477 0 0
Foster	1,466 0 0

For alterations and additions to No. 1, Copthall-court, Throgmorton-street, City, for Mr. H. Solomon. Mr. B. Tabberer, architect :—

Larke	£728 0 0
Whittingham	674 0 0
Crabb & Vaughan	663 0 0
Sergeant	660 0 0
Prince	630 0 0

For new cemetery at Bristol. Mr. H. Masters, architect :—

Buildings, Roads, and Boundaries.

Davis & Son	£5,895 0 0
Diment*	5,848 0 0
Storkey	5,800 0 0
Eastabrook & Son	5,620 0 0
Wilkins & Son	5,555 0 0
Baker*	5,550 0 0
Kingstone*	5,492 0 0
Reven & Son	4,998 0 0
Brown	4,799 0 0
Stevens	4,686 0 0
Brock (accepted)	4,533 0 0

Planting, &c.

Maul & Sons	£248 0 0
Sealey & Son	160 0 0
Nelson (accepted)	133 0 0
Garraway & Co.*	130 0 0

* Informal.

For restoration of cooperage destroyed by fire, in Marine-street, Bermondsey, for Mr. David Bradford. Mr. G. J. Loe, architect :—

Haben	£719 10 0
Crabb & Vaughan	549 0 0
Morter	545 0 0
Edwards	515 0 0
Machin	494 14 0

For Islington New Workhouse, St. John's-road, Upper Holloway. Mr. R. H. Burden, architect :—

Hot-water and Steam-Boilers, Engine, and Laundry Fittings.

Turner & Co.	£1,678 8 0
Cottam & Co.	1,650 0 0
Hodge & Sons	1,550 0 0
Fraser & Sons	1,495 0 0
Benham	1,467 0 0
Jeakes & Co (accepted)	1,323 0 0

Lifts to Main House and Infirmary Buildings.

Benham & Sons	£230 0 0
Bunnett & Co.	200 0 0
Jeakes & Co. (accepted)	188 0 0

External Hydrants.

Jeakes & Co. (accepted)	132 0 0

TO CORRESPONDENTS.

Dr. L.—R. S.—D. G.—J. C.—W. H.—D.—C. W.—J. F.—C. K. W.—R. L. S.—W. T. D.—W. O. C.—J. D. P.—W. L. S.—T. O.—H.—J. C.—Old Subscriber. — G. R. — H. A. — W. J. S. — A. C. — D. R. & D.—J. M. A.—Mr. F. — C. & Co. — P. C. — W. A. L.—J. W. — R. & W.—C. C. H.—Miss B. — D. & E. — N. & F. — W. G. B. — H. S.— J. D.—S. H.—S. F. C.—C. & V.—S. S.—J. McL.—C. L. L.—C. J. N.—J. H. G.—B. B. (taking the figures of one week only induces an altogether erroneous inference).—J. R. F. (shall have attention).—B., Son, & B. (not our practice).—L. E. L. (no advantage could result from an answer to question so put).—J. S. A. (we should think it very likely).—R. S. (next week).

We are compelled to decline pointing out books and giving addresses.

All statements of facts, lists of Tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

IMPROVED MACHINERY, combined with STEAM POWER, is employed by J. W. BENSON in the Manufacture of Church, Turret, Stable, and Tell-tale Clocks, Sun and Wind Dials, Perpetual Calendars, and every description of Clock and Watch Work. Architects, Builders, Committees, &c. can be promptly supplied with estimates. A descriptive Pamphlet on Church and other Clocks, post-free, 2d. J. W. BENSON, by special appointment, Watch and Clock Maker to His Royal Highness the Prince of Wales. Steam Factory for Clocks and Watches, 58 and 60, Ludgate-hill; Showrooms, 25, Old Bond-street, London.

TO SUBSCRIBERS.

The Publisher cannot be responsible for TESTIMONIALS *left at the Office in reply to Advertisements, and strongly recommends that* COPIES ONLY *should be sent.*

Advertisements cannot be received for the current week's issue later than THREE o'clock, p.m., *on THURSDAY.*

☞ *NOTICE.—All Communications respecting Advertisements, Subscriptions, &c., should be addressed to "The Publisher of the Builder," No. 1, York-street, Covent Garden. All other Communications should be addressed to the "Editor," and* NOT *to the "Publisher."*

ADVERTISEMENTS.

Now ready, the New Edition (Fifty-second), price 4s.; per post, 4s. 4d. of

LAXTON'S BUILDERS' PRICE BOOK,

being for the Year 1870.

"LAXTON'S BUILDERS' PRICE BOOK" has been for half a century the acknowledged authority in the Building Trades as to Prices.

The present Edition has had great pains bestowed upon its revision. It has been very carefully remodelled; several new features have been added; and the information is brought down to the latest date.

London: MORGAN & CHASE, 23, Ludgate-hill.
And may be ordered of any Bookseller in the Kingdom.

Just published for 1870, price 4s, the Sixtieth Edition of

SKYRING'S BUILDERS' PRICES,

calculated from the prime cost of materials and labour, to do justice to the employer, master builder, and workman, containing the whole of the Metropolitan Building Act, and a variety of useful information.

SIMPKIN & CO. Stationers'-court, London; and may be had of all Booksellers.

CASSELL'S TECHNICAL SERIES.—

Containing all the essentials of Technical Education.
Price Two Shillings each.

1. LINEAR DRAWING, adapted to Trade and Manufacture.
2. PROJECTION of PLANS, Elevation of Solids.
3. BUILDING CONSTRUCTION and Architectural Drawing.
4. SYSTEMATIC DRAWING and SHADING.
5. DRAWING for CARPENTERS and JOINERS.

*** Detailed Catalogues of the above Works may be had of any Bookseller, or post free on application to CASSELL, PETTER, & GALPIN, Ludgate-hill, E.C.

Fcap. 8vo. cloth, price 2s.; free by post, 2s. 2d.

THINGS WORTH KNOWING; or, the Book of General Information about Government, Manufactures, Minerals, Vegetables, Animals, &c.

*** A Catalogue of Books sent free.
London: WILLIAM TEGG, Pancras-lane, Cheapside.

HEWETSON & THEXTON send Free by Post an Illustrated Priced Catalogue of their CABINET FURNITURE, as adapted for the entire furnishing of genteel residences. Bedroom Furniture in porcelain colours, &c.—HEWETSON & THEXTON, Manufacturers, 200, 202, and 204, Tottenham-court-road, N.B. (Nearly opposite the Chapel), London, W.

Now ready, with 140 Illustrations, and a Portrait of Count Rumford, in royal 8vo. price 12s. cloth.

OUR DOMESTIC FIRE-PLACES: a New Edition, entirely re-written, enlarged, and adapted for popular reading, the additions completing the Author's contributions on the domestic use of fuel and on ventilation.

By FREDERICK EDWARDS, Jun.

*** This volume contains an historical account of the open fire-place, and a full description of the most efficient means of maintaining a supply of pure warm air in dwelling-houses.
London: LONGMANS, GREEN, & CO. Paternoster-row.

LICHFIELD CATHEDRAL.

In Fcp. 4to. with 5 Photographic Illustrations, price 15s.

HISTORY of LICHFIELD CATHEDRAL from its FOUNDATION to the PRESENT TIME; including Full Descriptions of its Architecture and Monuments.

By J. R. STONE, F.S.A. &c. Member of the Society of Arts.
London: LONGMANS, GREEN, & CO. Paternoster-row.

SEWAGE IRRIGATION.—REPORT upon the RUGBY SEWAGE IRRIGATION FARM, for the year 1869.

By J. R. PALMER, Town Surveyor.
Free by post for 13 stamps.
TAIT & SONS, Advertiser Office, Rugby.

In Monthly Parts, price each. New Series, now ready, Part I.

THE WORKSHOP. This Journal may be aptly considered as a practical and decorative work of art, furnishing specimens, with working details, for all branches of art, industry, and trade manufacture. The designs, executed in the first style of art, in all cases where not original, are copied from the best existing examples, both English and foreign, by which the artist and manufacturer have presented to them a combination of all styles extant. In order to excite, and, to some extent, satisfy, the ever-increasing desire for knowledge amongst our artizans, with whom we expect this work to be a special favourite; the value of the same is further enhanced by letterpress, treating upon the history and present state of all branches of industrial pursuit; as also notices of the latest inventions and practical receipts. A sheet of details to a large size will be given as supplement with each Part.

The First Series, for 1868-69, now ready, 1 vol. price 32s. cloth lettered.

London: JAMES HAGGER, 67, Paternoster-row.

PERFECTION in BOOKKEEPING.—

BUILDERS and Others desiring a really good system, can have a SET of MODELS for BUILDERS' BOOKS, by DOUBLE ENTRY, to which was awarded the prize offered in "The Builder," No. 1,160, and which has been adopted by many large firms. Also a Modified Arrangement by Single Entry, suitable for small builders.—Address, E. A. 4, St. George's-road, Regent's Park, London.

SCHOOL FITTINGS.—MESSRS. BANKS & CO.'S PATENT.
REVISED ILLUSTRATED PRICE LISTS
Of every Article required in a well-furnished School, sent for three stamps.
PARSONAGE WORKS, ALBERT-STREET, MANCHESTER.

TO ARCHITECTS AND SURVEYORS.

DESIGNS PREPARED from ROUGH SKETCHES or otherwise, in the best style of art. Perspectives outlined or etched. Quantities, billing, and abstracting with accuracy. Terms moderate.—Address Mr. TAYLOR, 17, Thavies-inn, Holborn.

DECORATIVE ARTS.—R. YARROW (late YARROW & SON), ARTIST, INTERIOR DECORATOR and DESIGNER. Established 1814. Decorations carried out. Designs and Working Drawings prepared in any style at the shortest notice and on the most reasonable terms.—Address, 67, HERBERT STREET, New North-road, N.

TO BUILDERS, DECORATORS, &c.

GILDERS, thoroughly experienced in House Work, Decorative Furniture, and Gilding in all its branches, may be OBTAINED at the House of Call, Marlborough Inn, Blenheim-steps, Oxford-street. Work done by the day, hour, or job. Materials found if required.—Address to the Secretary.

TO THOSE contemplating BUILDING in LONDON or the COUNTRY.—A City ARCHITECT and SURVEYOR, of considerable experience, OFFERS his SERVICES. Remuneration based upon a fixed scale of charges.—Address, BETA, Office of "The Builder."

TO INVENTORS.—The Inventors' Patent-right Association, Limited (MARSDEN LATHAM, Esq. Chairman), OBTAINS PATENTS for INVENTIONS at fixed and moderate charges: develops, negotiates, and advises on inventions. Hand-book gratis.—T. MORGAN, Secretary, 21, Cockspur-street, London.

TO ARCHITECTS, &c.

TEMPORARY ASSISTANCE. — Designs, Competition, Artistic, and Working Drawings, PREPARED, Land and Town Surveys made, and Estates laid out: also plans, specifications, and quantities for builds a, by C. & L. 57, Gracechurch-street, E.C.

TO ARCHITECTS AND SURVEYORS.

WANTED, EVENING or OCCASIONAL WORK, by a good practical DRAUGHTSMAN and DESIGNER. Aged 24. Well up in church, villa, and general work, perspective, colouring, &c. Drawings worked by the set or per hour. First of testimonials: specimens. Terms extremely moderate.—Address, ALPHA, 2, Southerton-road, Hammersmith, W.

PARTNERSHIP. — WANTED, a PARTNER, to take the place of one retiring through ill health, in a Building and Contracting Firm, which has been carried on for the last thirty years, having a good connexion in the Midland Counties, and at present having several good contracts in hand. The business turn over has been from 12,000l. to 17,000l. per year for the last few years, and with an energetic partner could easily be extended. One to take the superintendence of timber department preferred.—Applications addressed to H. A. Post-office, Sheffield, will meet with attention.

TO PLUMBERS, GASFITTERS, GLAZIERS, AND PAINTERS.

A FINE OPENING for a respectable, well-educated Young Man, about 30, as BOOK and STORE KEEPER. Must thoroughly understand the above branches, so as to work at them when required. Wages to commence with 30s. per week. 200l. security required.—Apply to A. T. BUSHELL, Britannia Works, Ashton-under-Lyne.

AGENTS WANTED in various parts of Great Britain, by J. STONE & CO. Deptford, London, to push the sale of their Patent "Universal" Brass Regulators for Water-closets, acknowledged to be the cheapest and best in existence. Liberal terms allowed.

TO PARENTS AND GUARDIANS.

AN ARCHITECT, late of some standing in London, married, and now residing in the country, offers great advantages to an educated YOUTH as RESIDENT PUPIL, desirous of obtaining a thorough knowledge of drawing, practical building, and fine art work, in furniture and decoration. One who has no objection to devote part of his time to the bench preferred.—Address, J. D. care of Mr. Reeve, Builder, Guilsborough, Northampton.

A LONDON ARCHITECT, of twenty years' practice, will shortly have a VACANCY for an ARTICLED PUPIL.—For terms, apply to HENRY DAWSON, Esq. 16, Finsbury-place South, E.C.

A FIRM of ENGINEERS, Ironfounders, General Contractors, and Builders, in South Wales, require the SERVICES of a competent Man as CASHIER and BOOK-KEEPER, and to Take the General Superintendence of the Office.—Apply, by letter, stating age, salary required, &c. to BARNARD, THOMAS & CO. Accountants, Swansea.

BOARD of POLICE of GLASGOW.—INSPECTOR of NUISANCE.—The Board is desirous of securing the SERVICES of a thoroughly qualified officer as INSPECTOR of NUISANCES for the city. Salary, 300l. per annum.—Applications to be lodged with the subscriber on or before SATURDAY, the 5th FEBRUARY next, marked "Application—Inspector of Nuisances."

JOHN LANG, Clerk of the Board.

Central Police Chambers, Glasgow, 25th January, 1870.

BUILDER'S FOREMAN WANTED for Villa Building, at a watering-place in Kent, and to work as a clever Joiner.—Direct in own handwriting, to No. 185, Office of "The Builder."

MAHOGANY and TIMBER TRADE.—TRAVELLER WANTED. Must have a connexion. State age and salary required.—Address, A. X. B. Office of "The Builder."

SALESMAN WANTED for ornamental GAS FITTINGS, &c. He must write and draw well, have been accustomed to the best class of business, and be willing to make himself useful in the showrooms.—Apply by letter, stating previous employment, age, salary expected, &c. to M. & F. care of Messrs. Staunton's, 9, Strand.

THE Enfield Local Board of Health require the services of a person competent to undertake the duties of ENGINEER and GENERAL SURVEYOR of the Parish. Salary, 250l. per annum.—Applications to be sent, on or before the 25th of FEBRUARY next, to the Clerk, from whom all information as to the duties of the office can be obtained.—By order of the Board,

Enfield, Middlesex. E. LETCHWORTH, Clerk.

WANTED, a competent Man, in a House-decorating Establishment in the West of England. He must be (especially) a good oak grainer and a fair hand at the other woods, marbling, &c. A good writer would be preferred. Constant employment.—Address, stating terms, D. *Western Daily Press* Office, Bristol.

TO BUILDERS' ASSISTANTS.

WANTED, in a Country Builder's Office, one who thoroughly understands Keeping of Books, Prime Cost, and Measurements, to ASSIST the principal in the general management of the business. A joiner by trade would be preferred. Address, with references and salary required, BUILDER, 8, Chenies's Printing-office, Godalming, Surrey.

TO BUILDERS, SURVEYORS, &c.

WANTED, by a practical Builder, an ENGAGEMENT as FOREMAN. Age 43. Twenty years' experience in building on own account, and contracting extensively in first-class property for decorating, &c. Country not objected to. Address, G. H. U. Post-office, Brixton-rise, S.W.

TO BUILDERS AND OTHERS.

WANTED, by a Builder's Son, aged 22, of good education, who is obliged to seek employment through pecuniary losses, a SITUATION, in any capacity. Good penman, and quick at measurements. Salary moderate.—Address, TAYLOR, Fitchwick House, East Barnet-road, New Barnet.

TO BUILDERS, IRONMONGERS, GASFITTERS, &c.

WANTED, by an experienced Man, a Job as WORKING FOREMAN, or would Take Work in Gas, Hot-water, Bells, &c.—Address, S. M. care of Mr. Sharp, 2, Little Marlborough-street, Regent-street, London.

TO CARPENTERS AND BUILDERS.

WANTED, by a Young Man, who is generally well up in the trade, a JOB as IMPROVER. Bench preferred. — Address, R. I. 59, Upper Marylebone-street, Cleveland-street, W.

WANTED, by a thorough practical PLUMBER, a CONSTANT PLACE, or a job, who well understands hot-water fitting. No objection to fill up his time in painting or glazing, if required. Good references.—W. H. 51, Queen-street, Edgware-road.

TO BRICK, TILE, AND PIPE MAKERS.

WANTED, a SITUATION, as WORKING FOREMAN of the above, or take at per 1,000 (labour only). No objection to go abroad. Good references given. Address, G. W. D. Quiney Hatch, Post-office, Middlesex.

TO BUILDERS AND DECORATORS.

WANTED, by a good, experienced London GRAINER and MARBLER, a SITUATION or JOB. Can be well recommended, and specimens of work seen. Imitation of inlaid work neatly executed. Jobs promptly attended to in town or country on the most reasonable terms.—Address, W. C. K. 18a, Seymour-place, Brompton, W.

TO BUILDERS, CONTRACTORS, &c.

WANTED, a RE-ENGAGEMENT, by a thoroughly practical GENERAL FOREMAN, who is thoroughly up to his duties in all branches. First-class references and testimonials.—Address, 194, Office of "The Builder."

TO ARCHITECTS AND BUILDERS.

WANTED, by an experienced, practical CLERK of WORKS, a RE-ENGAGEMENT, or a Situation as MANAGING FOREMAN. Competent to prepare fair working drawings, measure up work, and take out quantities.—Address, M. N. 8, Ebenezer-place, North-end, Fulham, S.W.

TO BUILDERS AND CONTRACTORS.

WANTED, by the Advertiser, a Builder's Foreman, a SITUATION as GENERAL or SHOP FOREMAN. Good draughtsman. Well up in all branches of the Building trade. Wages low. First-class references from London Builders.—Address, G. L. 15, Princes-street, Walworth-road.

WANTED, a YOUTH, as CLERK in a Surveyor's Office. Well up in figures.—Address, by letter, stating terms and references, 191, Office of "The Builder."

WANTED, EMPLOYMENT, by a respectable Man, aged 32, as PLUMBER, Painter, Glazier, and plain Zincworker, or as a General Hand. Well up in jobbing work. Well able and willing to make himself generally useful in anything required, principally at jobbing work. Wages very moderate.—Address, H. H. 72, Milton-street, Dorset-square, N.W.

TO BUILDERS, PLUMBERS, &c.

WANTED, as WORKING FOREMAN, or otherwise, by a first-class PLUMBER in all its branches, iron service, zinc work, and gasfitting. Has no objection to fill up time with painting, for a permanency or job.—Address, PLUMBER, 3, Chatham-street, off Grosvenor-street, Camberwell.

TO ARCHITECTS AND SURVEYORS.

WANTED, a RE-ENGAGEMENT, by a thoroughly efficient and practical ASSISTANT, accustomed to the management of an office. Well practised in design, and all kind of office work, and also to superintend works.—Address, 146, Office of "The Builder."

TO BUILDERS.

WANTED, by a CARPENTER, to work out a Carcase, or a Plot of Freehold Land. Town or country. Address, A. B. 27, Preston-street, Green-street, Bethnal-green, E.

WANTED, by an intelligent Youth, a SITUATION as TRACER in an Architect and Surveyor's Office.—Address, W. K. 69, Lincoln's-inn-fields.

WANTED, by a practical Man, with the highest references as to ability, sobriety, and integrity, a SITUATION as SHOP or OUT-DOOR FOREMAN for a Builder. Is well acquainted with machinery.—Address, W. V. 24, George-street, St. John's terrace, Latimer-road, Notting-hill, W.

TO BUILDERS AND CONTRACTORS.

WANTED, by a Young Man, aged 20, who has been five years at the bench, EMPLOYMENT as an IMPROVER in a JOINER'S shop.—Address, 131, Office of "The Builder."

TO ARCHITECTS.

WANTED, by a practical Man, a RE-ENGAGEMENT as CLERK of WORKS. Can prepare working drawings, and measure up work.—Address, 129, Office of "The Builder."

WANTED, by a young Man, an ENGAGEMENT as GRAINER and MARBLER.—Address, A. B. Post-office, Blackman-street, Borough.

TO BUILDERS, &c.

WANTED, a RE-ENGAGEMENT, as CLERK of WORKS, GENERAL or SHOP FOREMAN. Experience, shrewdness, efficiency, and superior ability, combined with sobriety and a stainless character.—Address, W. H. 33, High-street, Clapham, S.W.

TO ARCHITECTS, &c.

WANTED, a RE-ENGAGEMENT, as ASSISTANT in an Architect's or Surveyor's office. Five years' experience, and undeniable references.—Address, W. D. 103, Manor-street, Chelsea, S.W.

TO IRONMONGERS, BUILDERS, AND OTHERS.

WANTED, a SITUATION, as WHITESMITH, Locksmith, Bellhanger, Gasfitter, Stove and Range Work, Forge Work, &c. or as GENERAL HAND. Aged 23. Town or country.—Address, S. R. 33, St. Peter-street, Hackney-road, N.

WANTED, an ENGAGEMENT, by a thoroughly practical Man, as CLERK of WORKS, or Superintendent on an Estate. Testimonials for honesty and competency, having served seventeen years as Builder's Foreman in one firm.—Address, F. H. Post-office, Forest-hill, S.E.

TO BUILDERS, SURVEYORS, &c.

WANTED, a RE-ENGAGEMENT, as CLERK. Well up in prime cost, measuring, and all office work. Eight years' experience. Good references. Town or country. Aged 23.—Address, T. C. 24, Walworth-road, S.E.

TO BUILDERS, HOUSE AGENTS, &c.

WANTED, by the Advertiser, a SITUATION as PLUMBER, GLAZIER, and PAINTER. Can do plain sign-work and paperhanging, and understands general repairs of houses.—Address, PLUMBER, 1, Lockhart-terrace, Sall's Pond road, London.

TO BUILDERS, &c.

WANTED, an ENGAGEMENT, by an experienced MACHINIST. Can work moulding machine, joiners' benches, sharpen saws, make cutters, &c. Town or country. Address, R. H. 11, Henley-street, Battersea Park, S.W.

TO BUILDERS AND CONTRACTORS.

WANTED, by a thoroughly practical Man, a RE-ENGAGEMENT as FOREMAN of BRICKLAYERS or CLERK of WORKS, or to Take Charge of a Job. Good reference.—Address, G. H. W. care of Mr. Mills, Hope Cottage, Knight's-hill, Lower Norwood, S.E.

TO BUILDERS, PLUMBERS, AND OTHERS.

WANTED, by a respectable Young Man, a SITUATION as POTMAN. Good reference.—Address, J. F. S. 9, Cumming-street, Pentonville-hill.

TO BUILDERS AND PLUMBERS.

WANTED, by a good PLUMBER, GASFITTER, and PLAIN ZINC WORKER, well up in hot-water and bath work, a constant SITUATION, or Job. Town or country. Competent to take charge of a Shop or Job.—Address, stating wages given, PLUMBER, 50, Brindley-street, Harrow-road, Paddington, W.

WANTED, a RE-ENGAGEMENT, as WORKING SHOP FOREMAN of JOINERS, or as General Out-door Foreman, by a thoroughly practical Joiner and Staircase Hand. Aged 31. Well up in setting out all kinds of work. First-class testimonials from London firms. Country not objected to.—Address, A. B. 10, Aldeaham-street, Somers Town.

WANTED, a RE-ENGAGEMENT, as OUT DOOR FOREMAN, by a thoroughly competent Man of many years' experience with London builders.—Address, 131, Office of "The Builder."

WANTED, a SITUATION or JOB as FOREMAN, WORKING FOREMAN, or otherwise, in the Decorating, Plumbing, &c. Sixteen years' practical experience with first-class work and men in all the branches of the trade. Good references. Wages moderate.—Address, H. H. Post-office, Mecklenburgh-street, Bloomsbury, W.C.

TO ARCHITECTS, SURVEYORS, AND BUILDERS.

WANTED, by a good General ASSISTANT, a SITUATION in either of the above offices.—Address, T. B. P. 15, Burton-crescent, Tavistock-square, W.C.

WANTED, an ENGAGEMENT, in a Builder and Contractor's Office, by a Young Man, who has lately been engaged in an architect's office. Has a knowledge of quantities and accounts.—Address, D. 30, Post-office, Yeovil.

WANTED, by a practical and energetic Man (Carpenter), a RE-ENGAGEMENT, as FOREMAN (Working or otherwise), or Charge of a Job. Town or country. Thoroughly conversant with the management of all trades, prepares working drawings, measures up work, &c. Testimonials and references.—Address, B. B. 78, Lillington-street, Pimlico, S.W.

TO BUILDERS AND CONTRACTORS.

WANTED, by a thoroughly practical Man, a RE-ENGAGEMENT as FOREMAN, the works where last employed being completed. Reference to employer.—Address, B. F. 98, Lillington-street, S.W.

TO CONTRACTORS AND BUILDERS.

WANTED, by a thoroughly practical Man, a RE-ENGAGEMENT as GENERAL FOREMAN, or to Take Charge of a Job. (Joiner.) First-class references from London firms.—Address, T. R. 6, Palace-road, Lambeth.

WANTED, by a Young Man, of Christian principles, aged 20, a SITUATION as TIMEKEEPER, Junior Clerk, Collector, &c. At pre ent disengaged. Twelve months in last situation. Good testimonials and references given as to honesty and capability.—Address, D. R. 80, Whitfield-street, Tottenham-court-road, W.

TO PLUMBERS AND BUILDERS.

WANTED, by an experienced PLUMBER, a SITUATION or JOB, or Take the Management of a Shop. No objection to fill up his time in painting, &c. Can be well recommended.—Address, M. K. Pasaverance Coffee-house, Charles-street, Hatton-garden.

WANTED, by an experienced Draughtsman, a RE-ENGAGEMENT in an Architect's or Surveyor's Office. Large salary less an object than permanent employment. Good references.—Address, ALPHA, Mr. Cost's, 4, Freeman's-court, Cheapside, E.C.

TO BUILDERS, ENGINEERS, &c.

WANTED, a RE-ENGAGEMENT, as FOREMAN of SMITHS. Eighteen years' experience. Good reference can be given.—Address, A. B. 12, Regent-street, Westminster.

WANTED, EMPLOYMENT, by a CARPENTER and JOINER. Used to shop and office fittings, all kinds of blinds, and capable of taking charge of plans, specifications, and accounts.—Address, D. S. W. 78, Westminster Bridge-road, S.

TO PORTLAND CEMENT MAKERS.

WANTED, an experienced FOREMAN, who thoroughly understands the manufacture of Portland Cement.—Address, with full particulars as to age, wages, and where last employed, to G. & CO. Post-office, Great Yarmouth.

TO MASTER BUILDERS.

WANTED, Gentlemen thoroughly acquainted with the building trade and contractor's work generally, to join others in forming a Company of the highest respectability to undertake work in all parts of the country. Most of the funds can be provided, and applicants need only 1,000l. payable 100l. down, and remainder afterwards.—Address, W. M. Office of "The Builder."

TO BUILDERS AND OTHERS.

WANTED, a SITUATION, in the Office of above, as PRIME COST CLERK, &c. Over four years at last situation. Salary 30s.—Address, W. 36, Friday-street, City, E.C.

WANTED, a SITUATION, by a Young Man, aged 20. Has been four years in a Borough Surveyor's Office. Salary not so much an object as a permanent situation.—Address, J. F. Post-office, Boston.

VARNISH TRADE. — TOWN TRAVELLER WANTED, with a Connexion amongst Builders, Decorators, and Coachmakers in London, and who has also some knowledge of Merchants, Shippers, and Wholesale Dealers.—Address, J. P. care of Mr. Deacon, 154, Leadenhall-street.

THE Advertiser, a man of considerable practical experience (recently Surveyor to a Land Company), desires a RE-ENGAGEMENT as CLERK of WORKS, or Builder's General Clerk. Well up in specifications, preparing plans, setting out and measuring, levelling, and drainage works. Salary very moderate.—Address, W. Suffolk-villas, Holmesdale-road, Norwood.

THE Advertiser, who has had considerable experience in SUPERINTENDING WORKS, and understands levelling, surveying, taking out quantities, preparing drawings, &c. requires a SITUATION. Salary moderate.—Address, O. F. Mr. Fortune's, Rainhill, Lancashire.